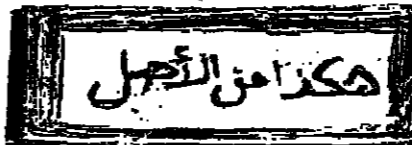


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NEWS SUMMARY

GENERAL

Top oil groups sued by U.S.

Nine major oil companies are being taken to court by the U.S. for alleged overcharging amounting to at least \$1bn. The companies include Exxon, Mobil and Texaco.

The suit, filed in Washington's district court by the U.S. Justice and Energy Departments, alleges that the companies breached Federal pricing regulations on natural gas liquids. It says they inflated prices in dealings among subsidiaries and set an artificially high market value.

This is the latest move in a campaign to clear up what the authorities say are illegal pricing practices stretching back to the 1973 Arab oil embargo. The other companies named are Gulf, Amoco, Atlantic Richfield, Shell, Phillips and Cities Services. **Back Page**

BUSINESS

German steel peace likely

WEST GERMAN steel strike seems likely to end on Thursday following an agreement between employers and trade union representatives. But there are hurdles to be cleared before a return to work becomes certain.

The accord was reached after 15-hour talks on the 41-day-old strike, which has so far cost the country DM 600m (£161m). The settlement covers pay increases and free time, but is based on a 40-hour working week.

To that extent, the key demand for a move towards a 35-hour working week by IG-Metall, the steelworkers' union, may be seen by some union members as unfulfilled. **Back Page**

ARMY

Army warned

King Juan Carlos of Spain gave an unprecedented call to order when he told chiefs of the armed forces that once an army lost its sense of discipline it ceased to be an army.

His remarks followed the funeral of Madrid's assassinated military governor, at which some army officers shouted anti-government slogans. **Page 4**

BL foundry plan attacked

BL COMPONENTS' announcement last night that it is pressing ahead with a £24.7m plan to build an aluminium foundry on a 25-acre site at West Yorkshire Foundries, Leeds, was met with an outcry from the private sector.

In spite of BL assurances that the company will still meet 40 per cent of its block and cylinder needs from private companies, the Light Metal Foundry Association said the move could jeopardise £100m of planned investment.

UK PROCESS plant manufacturer

CONTRACTORS John Brown has won a £20m contract to build a petrochemical plant for Shell, currently expanding its chemicals industry. The job was awarded to Brown by Mr. Kenneth Corfield, managing director of Standard Telephones and Cables. **Back Page**

ANNUAL rate of retail inflation

is likely to have remained within the range of 6 per cent last month, figures to be published this week are expected to show. **Page 4**

Army units and riot police

have been sent to Lima, Peru, and provincial centres ahead of the Communist-led 72-hour general strike due to start tomorrow. A state of emergency has been declared and martial law imposed. **Page 2**

Two people were wounded

and several houses burnt down when members of the mainly Syrian peace keeping force opened fire on Christian militia in Lebanon.

Two opinion polls published

by the Los Angeles Times suggest that voters would prefer Senator Edward Kennedy to President Carter as the Democratic Presidential candidate next year.

BRUNED and the UK signed

a treaty giving the Sultanate independence by 1983.

Alabama Governor George Wallace, who leaves office next week, said he hopes to see supporters at a rally in Montgomery.

First of the new £75,000 weekly Premium Bond prizes goes to the Barnet, London, holder of 132W 682815.

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Ministers meet on lorry strike's pay policy implications

BY NICK GARNETT & ELINOR GOODMAN

As the private-haulage lorry drivers' strike spreads to more areas today, Ministers in two Cabinet committees meet to discuss the effect of the dispute on pay policy, and on supplies to industry and shops.

The Government declared yesterday, however, that there was no question of introducing a State of Emergency at this stage.

The stoppage, now hitting industrial production in some areas, is being extended today to South Wales and the Eastern Counties. There will be tightening of disruptive picketing in parts of the Midlands and North.

An "emergency centre" at the Ministry of Agriculture begins operations this morning collecting and acting on inquiries from the food, farming and fishing industries, which face the most severe immediate effect of the strike.

The National Farmers' Union is holding an emergency meeting to assess the extent to which animal feed supplies are in danger.

Disruption to cargo-handling in some major dock areas, including north Humberside, Liverpool and Tilbury is likely to be extended to smaller ports.

Picketing by drivers on industrial sites is expected to be reinforced on south Humberside and in the West Midlands, including Wolverhampton.

Senior negotiators for separate regions of the Road Haulage Association, which has had its pay offers of 15 per cent rejected, meet in London today.

The association said that though it would review the offer, no improvement on the offers was planned.

The association's West Midlands region has reached agreement with union officials but the settlement simply involves a commitment on the part of employers to fix new pay rates at the highest general level reached at negotiations in other regions.

Some unofficial picketing is expected to continue in the area where the strike has been poorly supported.

In the oil delivery dispute four of the five main companies were still optimistic that their drivers would accept offers worth 12 to 15 per cent.

Shop stewards for drivers at Esso and Shell meet today. British Petroleum stewards tomorrow and Mobil later in the week.

A decision to accept would isolate the 1,100 Texaco tanker drivers and ancillary workers who have rejected 15 per cent, and whose picketing of other companies' depots has curtailed petrol deliveries.

Thatcher hints at curb on unions

By Elinor Goodman, Lobby Staff

MRS MARGARET THATCHER floated the idea of abolishing the right to strike of workers in essential industries such as gas and electricity when she spoke on television of big changes in laws affecting unions.

She confirmed that a Tory Government would introduce a law to help trade unionists hold secret ballots when they wanted them.

The Conservative Leader appeared to adopt a more abrasive attitude to the unions than those in her party specifically responsible for dealing with them.

Interviewed on London Weekend Television's Weekend World, she linked in a new way two ideas which have been gaining popularity in the party in the last few months: secret ballots and withholding of social security benefits to strikers.

Mrs. Thatcher said that if a consider giving social security work a Tory Government might voluntary ballot system did not and other benefits only to strikers who agreed to industrial action after a secret ballot.

Though she may have given the impression that the Tories would throw the book at the unions, she did not say much that had not been said before by the party's front-bench employment spokesman.

But her tough attitude to the unions will have comforted those on the Right who feel that the party may be getting too close to the unions.

The legal immunity enjoyed by unions would be reviewed she said, by a Tory Government in the light of the "very different power structure" which existed today.

The unions had been "put above the law" because at the time it was thought that they needed such immunity to get decent wages. Now conditions had changed totally.

As a Parliamentarian she was not prepared to enable anyone to have a "licence to inflict harm and damage on others and be immune from law."

At the moment there were some sectors, such as gas, electricity and water, in which the unions had the power to hold the nation to ransom.

This immunity, ironically, was given the unions as a result of the Tories own Industrial Relations Act, but there were certain services so vital that the right to strike might have to be reviewed.

A Tory Government would try to tax short-term social security benefits received by strikers, and give workers the right to legal compensation if sacked because of a closed shop.

Vietnamese take capital of Cambodia

BY DAVID HOUSEGO

VIETNAMESE FORCES with the help of Cambodian insurgents yesterday made a surprise advance and captured Phnom Penh, the Cambodian capital, according to an announcement over Radio Hanoi.

It claimed that the two-week invasion of the country was carried out by insurgents and said Phnom Penh and half Cambodia had fallen into their hands.

The pro-Vietnamese forces stormed into the city which has now witnessed its second "liberation" in three years at 17.30 GMT. A few hours before that Phnom Penh Radio, the official broadcasting station of Premier Pol Pot's Government, went off the air.

There was no news of Pol Pot but it was assumed that in line with a strategy believed to have been worked out with the Chinese four months ago, he decided to abandon the capital—defensible against superior Vietnamese ground forces—and attempt to fight a protracted guerrilla struggle with his base in the jungle south west of Phnom Penh. The city was almost deserted after the forced evacuation of its population by the Pol Pot regime.

Before the pro-Vietnamese forces took Phnom Penh, the President of the Kampuchea (Cambodia) National United Front for National Salvation (KNUPNS)—established a month ago—issued a radio call for surrender to the Pol Pot regime.

Significantly Chinese accounts of the conflict have ceased to mention Pol Pot's name—an indication that they are possibly hoping to replace him by Sihanouk as a figure more acceptable in Vietnam and internationally.

Until his arrival in Peking, Prince Sihanouk had not been seen for two years although he has been in Cambodia.

The Soviet official news agency TASS announced the fall of Phnom Penh in a brief communique without comment. But recent Soviet Press comment has come out strongly against what it describes as "the reactionary Pol Pot-Sary clique" and has voiced strong support for the Cambodian Salvation Front (KNUPNS).

The Soviet view, expressed through the media, is that the Front "enjoys broad support among the people of Cambodia who have risen in a just struggle for the overthrow of the Phnom Penh regime."

West agrees China must not affect detente

BY RICHARD EVANS AND ROBERT MAUTHNER IN GUADALOUPE

WESTERN LEADERS agreed at the two-day summit here to ensure that developing economic and political contacts with China must not affect the crucial relationship between the West and the Soviet Union.

This, together with outspoken European support for a SALT 2 agreement, was the most significant outcome of what appears to have been a successful attempt to maintain and improve a common front between President Carter, Chancellor Schmidt and Prime Minister Callaghan on political and security issues affecting the West.

President Carter, summing up his view of the wide-ranging discussions on the French Caribbean island, said the U.S. Government was determined to support the emergence of China as a world power but this must not be allowed to become an obstacle to detente.

And Mr. Callaghan stressed that the relationship between the West and the Soviet Union remained central to the security of Western Europe.

Chancellor Schmidt, although not opposing the prospective Franco-British arms sales, including the vertical take-off Harrier jet, sounded a warning against too much euphoria in the opening of relations between the West and China.

Although security matters, and the SALT talks in particular, dominated the summit, a consensus was reached on a range of issues including Iran, Turkey and Southern Africa.

It was decided it was essential to pump financial aid rapidly into Turkey to support the crumbling economy of a country on NATO's vital eastern flank.

None of the four leaders gave any indication of support for the Shah of Iran and President Carter and Mr. Callaghan had an hour's talk on Rhodesia.

The Americans were particularly relieved at the strength of support given by the three European leaders to the conclusion and early ratification of the SALT negotiations. There appeared to be a concerted move to try to persuade the U.S. Senate to ratify SALT as soon as negotiations are completed by President Carter and Mr. Brezhnev, the Soviet leader.

The prospect that SALT 3 will deal with the reduction of strategic arms aimed specifically at European targets will almost certainly lead the Soviet Union to demand that the British and French nuclear forces should be included in the negotiations. The U.S. will face strong opposition from France which is unwilling to allow any dilution of nuclear independence.

The French claim that the British position on the subject is very close to their own, but there were strong indications here that Mr. Callaghan had taken a more flexible line. As far as Britain is concerned, much will depend on the extent to which the Soviet Union is prepared to accept limitations on the number of its new powerful SS-20 missiles and Backfire bombers which have been developed for use against Western European targets.

During the discussions on disarmament, President Giscard's proposal for a Europe-wide disarmament conference covering conventional weapons, received a mixed reception.

President Carter, Mr. Callaghan and Herr Schmidt emphasised that they wanted to press ahead with the current mutual and balanced force reduction talks (MBFR), from which the French have stood aside. Mr. Callaghan nevertheless said that M. Giscard's proposal was interesting and worth of study.

The Guadeloupe Summit Page 2 Editorial Comment, Page 1v

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The Guadeloupe Summit Page 2 Editorial Comment, Page 1v

Further violence in Tehran on day of mourning

BY JONATHAN CARR

SPORADIC street violence erupted in Tehran yesterday during a day of mourning declared by the new Government of Dr. Shapur Bakhtiar to mark the deaths of anti-Shah protesters last week.

There were fears that similar trouble would occur today because of another day of mourning. This one was called by Ayatollah Khomeini, the Paris-based religious leader. The call also has the backing of the main local Moslem leaders. On Saturday Ayatollah Khomeini denounced the new Government as "illegal" and as "a plot of the Shah to stay in power."

He called for the struggle against the Shah to continue.

The new Government, which was sworn in by the Shah on Saturday, consists of 13 members besides Dr. Bakhtiar, most of them technocrats of no previous political affiliation.

Key members are General Fereidoun Jam, a retired armed services chief, as Minister of War, and Mr. Ahmad Mir-Fendereski, a respected diplomat at Foreign Minister. The other ministers, although lacking a political following, will have the task vital to the success of the Government, of persuading strikers in the key economic sectors to return to work.

An immediate priority of the Government is the trial of as many as 30 former ministers, including ex-premier Amir Abbas Hoveida, on corruption charges. Mr. Cyrus Amouzegar, the Minister of Information, appeared to be a Government's first task would be to pass a new law to deal with these offences.

The early departure abroad of the Shah is considered crucial to the success of the new government. Parliament is expected to meet on Tuesday when its approval of the new Cabinet will be sought. The Shah told the new ministers on Saturday he would be leaving Iran for a rest and that he was tired of bearing all the responsibilities for the country.

In keeping with the Constitution, the Shah will be represented after his departure by an appointed Regency Council. This has never been set up before during previous absences of the Shah.

Economic dislocation continues. Banks and shops were shut as part of the day of mourning, and there were still long queues for petrol and fuel for heating. Oil production has increased only marginally despite an agreement with striking oil workers. But output is only 285,000 barrels a day compared with a maximum attainable 6.5m barrels a day. Domestic requirements are about 700,000 barrels a day.



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OVERSEAS NEWS

THE INDO-CHINA CONFLICT

The new rulers of Cambodia

BY DAVID HOUSEGO, ASIA CORRESPONDENT

THE NEW Cambodian regime now nominally in charge of the capital Phnom Penh can be expected to seek diplomatic recognition as the country's legitimate government as quickly as possible. Expected only a month ago under the wings of Vietnam as the National Union Front for the Salvation of Kampuchea (KNUFS), relatively little is known about its organization and leadership.

an attempt to win popular sympathy against the harsh regime of Pol Pot. It promises freedom of movement, association and religion, and to abolish the resettlement policy under which people were forced to leave their homes and work in special communes.

China wall poster appeals for detente

A dramatic wall poster calling for detente with the Soviet Union and the removal of the late chairman Mao Tse-tung's body from his mausoleum drew big crowds in Peking over the weekend, but doubts were raised about its authenticity.

THE GUADELOUPE SUMMIT Sun, SALT and Sand

BY ROBERT MAUTHNER IN GUADELOUPE

THERE ARE only two ways in which you can discuss the possibility of the prevention of a holocaust provoked by the massive use of strategic nuclear weapons, one of the main subjects of the Guadeloupe four-power summit.

Washington unclear on Soviet role

BY JUREK MARTIN, U.S. EDITOR, IN WASHINGTON

ALTHOUGH THE U.S. State Department warned that the Vietnamese capture of Phnom Penh could "seriously aggravate" the situation in China, the actual fall of the Cambodian capital came as little surprise here.

There is greater concern that Vietnam, acting on its own, or the best of the Soviet Union as a counter to the normalisation of Sino-American relations, would pursue militarily aggressive policies not only in Cambodia but towards Thailand and Laos.

THE CRISIS IN IRAN Caution by U.S. banks

BY STEWART FLEMING IN NEW YORK

SOME U.S. banks have been cautiously scaling down their commitments to Iran in recent months until they can get a clearer view of the likely impact of the current crisis on the country's finances.

Hungary raises prices

By Paul Lendvai in Vienna

STEEL PRICE increases for petrol and a wide range of consumer goods come into force today in Hungary but it is claimed that the increases will not affect the projected 4.7 to 4.9 per cent rise in the overall consumer price index for 1979.

Juan Carlos calls for discipline

BY ROBERT GRAHAM IN MADRID

KING JUAN CARLOS turned a weekend ceremonial meeting with senior members of the armed forces, into an unexpectedly tough lecture on the need for discipline.

Unions challenge Lisbon regime

BY OUR LISBON CORRESPONDENT

PORTUGAL'S conservative non-party Government faces a strong challenge from the Communist-dominated central trade union body CGTP over the continuation of the 20 per cent wage rise limit imposed last year.

Militia 'will resist' Lebanon force

BY DAVID LENNON IN TEL AVIV

THE ISRAELI-backed Christian forces in southern Lebanon will resist any attempt by the Lebanese Government to send its troops in the South, the Christians War Council decided at the weekend, according to Israeli radio.

India to buy Airbus

BY DAVID LENNON IN TEL AVIV

India is to buy another A-300 Franco-German Airbus to add to Indian Airlines' existing fleet of five Airbus aircraft, according to officials, Reuter reports from New Delhi.

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Pakistan poll call

BY DAVID LENNON IN TEL AVIV

THE Pakistan People's Party (PPP) of former Prime Minister Zulfikar Ali Bhutto has called for national elections by March 31 at the latest.

Yemen attack

BY DAVID LENNON IN TEL AVIV

Marxist South Yemen has launched an armoured attack on the neighbouring North Yemen district of Al Bayda, the London-based newspaper Ash-Sharq Al-Awsat reported at the weekend.

Oil supplies 'serious' says IEA

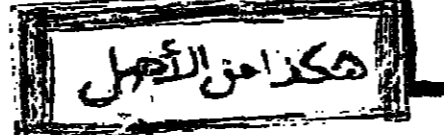
BY TERRY DODD SWORTH IN PARIS

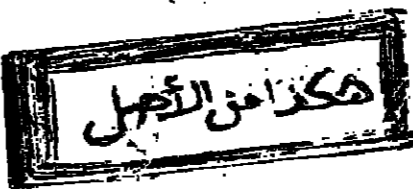
A SERIOUS oil supply situation, though not yet an emergency, has been created by the drying up of oil exports from Iran, according to the Paris-based International Energy Agency.

Arrests herald Peruvian strike

BY NICHOLAS ASHESHOV IN LIMA

ARMY UNITS and riot police moved into key positions in Lima, main provincial towns and large mining centres yesterday, in readiness for a Communist-led 72-hour general strike which is due to start at midnight tonight.





Carter to announce draft of GATT package today

BY JUREK MARTIN, U.S. EDITOR, IN WASHINGTON

THIS MORNING the Carter Administration will be making public the draft texts of the agreements designed to usher in a new multilateral trade era.

This is the first formal step in what is likely to be the difficult process of securing Congressional approval for the trade agreements. The intention is for the President to sign the agreements by April 5, 30 days after their formal publication in the Federal Register.

Although the President has the authority unilaterally to sign the tariff aspects of the trade pacts, the non-tariff elements, plus certain enabling legislation, must go through the Congress.

The Administration began formally briefing Congressional leaders on the multilateral trade negotiations (MTN) agreements last week in preparation for the reconvening of the legislature on January 15. In a letter notifying Congress of his "intent to enter into" the pacts, Mr. Carter said they were to "ensure that the international trading system is both fair and open."

In fact, the agreements themselves are not yet finally in place; the delay resulting from the refusal of the last session of Congress to extend the President's authority to waive the imposition of countervailing

duties beyond January 2. Request for such an extension will also be submitted to Congress and in the meanwhile U.S. customs officials are simply not collecting the duties that otherwise would be levied.

However, both Mr. Carter and his Special Trade Representative, Mr. Robert Strauss, emphasized that the final agreements were "within sight."

The summaries of the agreements already transmitted to key Congressional leaders are designed to present them in the best possible light as serving American interests. Most of the details of the codes covering the non-tariff elements have been public knowledge for some time but it is still clearly incumbent on the Administration to sell them effectively on Capitol Hill, particularly with the influx of a greater-than-usual number of new Congressmen and Senators in the upcoming session.

Thus, in summarizing the code on subsidies and countervailing duties, the Administration argues that it will permit the U.S. to "limit foreign government subsidy practices without sacrificing the ability to make effective use of the countervailing duty law."

The U.S. has, nonetheless, conceded in this code its pre-

Brazilian trade gap increases

By Diana Smith in Rio de Janeiro

BRAZIL was to have achieved a trade surplus of about \$500m in 1978. Instead, by the end of November, the trade gap had widened to \$899m.

In November, \$1.24bn worth of goods were imported and \$1.12bn exported, resulting in a monthly deficit of \$110m—some what larger than the "few pennies here or there," Sr. Mario Simonsen, the Treasury Minister, had predicted for the month.

Moreover, imports for the 11 months totalled \$12.35bn—\$940m more than in January- November, 1977, and exports totalled \$11.45bn—\$69m less than the exports total for the comparable period in 1977.

Sr. Simonsen, announcing the November figures, stated that he doubted whether the trade gap for the full year would reach \$1bn. However, monthly trade gaps since the beginning of the fourth quarter of 1978 have tended to be larger than the Treasury Minister's predictions.

The solid performance of manufactured goods, particularly vehicles, with foreign sales in 1978 of \$1.2bn, means that for the first time in Brazil's trading history, the manufactured exports accounted for the largest percentage of exports (32 per cent) with commodities, Brazil's traditional exports, representing the remaining 48 per cent.

However, this ratio is somewhat distorted because total export revenue was down by \$1.5bn. This was due to the persistently sluggish performance of commodity exports, particularly coffee, soy and sugar, because of poor weather, lower world prices and other problems. In addition, grain, vegetable and meat production for domestic consumption dropped severely, so that the authorities turned to importing these staples to ensure supplies.

The aspiration to achieve a 1978 trade surplus was rooted in the need to compensate for a services deficit, likely to be about \$5bn, swelled by interest and repayment on a foreign debt now calculated at \$41bn, payment of royalties or technology transfers estimated at close to \$500m for the full year, charter of ships (while Brazil holds up its own merchant fleet) costing \$550m for the year and other items that, in a country which does not attract mass tourism, cannot be balanced out by this invisible source of income.

U.S.-CHINA ACCORD

Ford reacts calmly to Taiwan 'shock'

BY CHARLES SMITH RECENTLY IN TAIPEI

FOREIGN INVESTORS in Taiwan are not packing their bags as a result of the U.S. decision to withdraw diplomatic recognition from the Taipei Government and establish an Embassy in Peking.

Some are not only planning to stay but are also planning to increase their stake in the country. An example is Ford Motor Company, which chose the aftermath of President Carter's normalisation broadcast as the moment to announce that it would implement a \$30m expansion plan at its Chung Li plant outside Taipei where Granadas, Cortinas and Escorts are assembled, and partly manufactured, for the Taiwan domestic market.

Ford is producing 90 cars a day at Chung Li (or would be if the recent strike at Ford UK had not obliged it to cut back temporarily on production of Escorts and Cortinas). It will be building 170 cars per day by early 1980 plus about 70,000 engines per year (double the present number) of which a substantial proportion will be exported to Australia and the Philippines.

Ford came into Taiwan in 1972 after a Japanese company, Toyota Motor, which had previously been involved in a licensing agreement with a local Taiwan company, had got cold feet (because of the political

situation), and pulled out. Toyota's departure meant that its expartner, the Taiwanese Lio Ho Group, badly needed a new source of capital and expertise from outside the country. Ford was able to buy a 70 per cent stake in what became the Ford Lio Ho Motor Company and enjoys the advantage of taking over a trained and experienced labour force (although one that spoke mainly Chinese and Japanese).

The company started by building the "utility" Flexa in Taiwan, but soon found that the local market wanted something more stylish, if also a little more expensive. Today Ford Lio Ho turns out about 1,200 Cortinas per month as well as 500 Escorts and perhaps a couple of hundred Granadas.

The engines and some of the parts are locally made but Sr. Raymond Chen, the Peking-born U.S.-naturalised chief executive of the company, says that each Escort and Cortina built at Chung Li contains an average of \$1,200 to \$1,500 worth of British components. On a rough calculation that would mean that Ford's operation in Taiwan is worth over \$20m per year to the British balance of payments, with the figure likely to increase sharply during the next 18 months.

Mr. Chen says that Ford was aware that American "de-recognition" of Taiwan was on

the cards when it decided to enter the country in 1972. The probability that the Americans would leave had become a virtual certainty by March this year when Ford was making some of the key decisions on its expansion programme.

The fact that Ford decided to press on regardless can be attributed, Mr. Chen says, in the first place to the conviction that Taiwan's political status will remain unchanged for at least the next five years and probably for far longer than that. Apart from that it takes little imagination to see that the island is a good place in which to make and sell cars.

Registrations in Taiwan have been increasing by between 20 and 25 per cent in the last few years and may grow faster now that a new freeway has been completed between Taipei (the capital in the north of the island) and Kaohsiung (a major industrial city in the south). Car imports are starting to be permitted under the Government's import liberalisation programme but not on terms which give Ford any cause for concern.

An effective 125 per cent rate of import tax means that an Opel Rekord sells in Taiwan at \$25,000 whereas Ford's comparable locally manufactured Granada costs \$12,500. The strength of Ford's market in Taiwan is measured by a 6,000-car order backlog, equivalent to

nearly one third of annual production at current rates. The backlog would be bigger, Mr. Chen says, if Ford dealers had not started turning away some customers who want early deliveries.

Mr. Chen rules out the prospect of car exports from Taiwan, at least for the time being, because the scale on which Ford Lio Ho operates is simply not large enough to make this economic. (He claims that Korean motor manufacturers, who do export, are losing at least \$2,000 per car—which Ford cannot afford to do because it is not a diversified enterprise able to treat car exports as a "luxury" to be subsidised by other lines of business.) This does not alter the fact that Taiwan's domestic market has many years of profitable growth ahead of it, or that exports of components and engines should continue to flourish.

As proof that Ford is not the only motor manufacturer which sees future possibilities in Taiwan, Chrysler and Perkins Engines (of the UK) are understood to be involved in discussions on a \$70m joint venture with a semi-governmental enterprise which would produce trucks. The Chrysler-Perkins team, quartered in Taipei's best hotel, appears to have been pressing on with discussions despite the "shock" of normalisation.

France defers Turkish debt

ANKARA — Turkey and France have signed an agreement here deferring payment of \$7.5bn owed by Turkey to the French Government and private concerns.

Under the agreement, the Turkish debt, which is, or is coming due, will be repaid in six to eight years with 7.8 per cent interest rate for private loans and 3.5 per cent for government loans, Finance Ministry officials said. They added that the agreement also provides for the release of a project credit of FFr 200m and a fresh cash credit of FFr 60m to Turkey.

Turkey has signed similar debt rescheduling agreements for a total debt load of \$1.4m under an umbrella agreement with the Organisation for Economic Co-operation and Development (OECD).

World Economic Indicators

		UNEMPLOYMENT			
		Dec. 78	Nov. 78	Oct. 78	Dec. 77
UK	000's	1,320.7	1,338.9	1,360.0	1,428.4
	%	5.5	5.6	5.7	6.0
Holland	000's	209.1	209.2	210.2	204.7
	%	5.3	5.3	5.3	5.3
W. Germany	000's	1,006.7	927.0	901.6	1,090.7
	%	4.4	4.1	3.9	4.8
France	000's	1,330.0	1,344.1	1,284.0	1,054.9
	%	5.7	5.7	5.5	5.1
Belgium	000's	297.1	279.9	268.6	296.7
	%	7.5	7.0	6.7	7.4
U.S.	000's	5,900.0	5,906.0	6,000.0	6,800.0
	%	5.8	5.8	6.0	6.9
		Sept. 78	Aug. 78	July 78	Sept. 77
Japan	000's	1,250.0	1,210.0	1,150.0	1,050.0
	%	2.2	2.3	2.3	1.9
		Oct. 78	July 78	April 78	Oct. 77
Italy	000's	1,651.0	1,658.0	1,450.0	1,598.0
	%	7.5	7.5	7.2	8.0

SHIPPING REPORT

Dramatic rise in oil tanker freight rates

BY LYNTON McJAIN

THE CLOSING MONTHS of last year witnessed the greatest rise in oil tanker freight rates since rates fell after the Middle East war five years ago. The rates held up well over the first week of the new year and the market was optimistic about prospects in spite of continued uncertainty about oil cargoes from Iran.

There was still a queue of over 50 large and very large crude oil tankers waiting for cargoes at Kharg Island, Iran last week. Other oil tanker chartering markets were active. Some in the Mediterranean, West African and Caribbean sea areas, were much more so than had been expected. The prospects of profitable trading, with independent tanker owners covering their operating and capital costs for the first time for five years, encouraged one major company to consider reletting its idle tonnage off Iran on other markets.

There were few requests for charters of very large and ultra-large crude carriers from the Middle East. Worldscale 30 was paid by Social for a 237,000-dwt vessel for immediate loading for a western destination.

Rates for 130,000 dwt to 150,000 dwt were also high. A Japanese charterer paid Worldscale 38 for a 153,000-dwt vessel.

Prospects for tanker trading in the rest of the months were said at the end of last week to be favourable. London brokers Galbraith Wrightson forecast that there would be a rise in new business from Mediterranean and North African load-

ing ports, with most cargoes bound for the U.S.

At the smaller end of the tanker scale, Worldscale 300 was paid for a 30,000-dwt white oil carrier for trading between the Mediterranean and Scandinavia, as charterers responded to the demand for oil caused by cold weather by paying high rates for vessels.

Time-charter business in most world markets also picked up over the past weeks, with Texaco negotiating for 12 months' trading with vessels up to 150,000 dwt.

The rising fortunes of the independent tanker owner were reported by Intertanko, the International Association of Independent Tanker Owners, in a report at the end of last year. This reported that 20m dwt of

oil tanker capacity had resumed trading in the last half of 1978. All the tonnage had obtained profitable work, but 30m dwt of capacity remained laid up.

Intertanko said that between January 1, 1974, and December 1, 1978, owners scrapped 1,222 tankers and combination carriers, a total of 45m dwt. Total demolition sales last year were expected to reach a new record of 15m dwt, with total fleet reduction of 16m dwt, after conversions and losses, compared with 10m dwt in 1977.

Tanker capacity used as floating oil storage at the start of this year reached a total of 7.5m dwt. Howard Houlder (Chartering said in a report published on Friday. There were 40 vessels involved.

Why come to Britain's largest unit trust group for pensions?

For the Self-Employed

Self-Employed Pension Scheme. This is a single premium scheme consisting of two separate plans - the Guaranteed Plan, which provides a pre-determined amount of pension in return for each contribution, and the Investment Plan which provides a pension based on the investment performance (see opposite) of either the Property or Equity Pension Fund. Contributions to both plans are eligible for tax relief.

Guarantee Plus Retirement Plan. This is a regular premium scheme that provides a guaranteed amount of pension which may be increased by bonuses, depending on investment performance. It is also suitable for employees who are not members of a company pension scheme.

For Controlling Directors

Since the 1973 Finance Act was passed, controlling directors have had far greater flexibility in making their own pension arrangements. Directors may now obtain substantial pension benefits, provide full protection for their dependants and secure significant capital transfer tax savings, all at a low net cost to their company. Our Executive Pension Scheme, described below, is a particularly effective way of providing all these benefits. The Scheme can be linked to any of the tax-exempt pension funds shown opposite.

For Key Executives

The Executive Pension Scheme is also suitable for companies which have contracted into the State Pension Scheme but wish to provide additional "topping up" benefits for key executives or particular groups of employees. The Scheme, which can be linked to any of the funds opposite, takes full advantage of tax relief on company and individual contributions. An important feature is that the Scheme involves the company in the minimum of administration.

For Pension Fund Trustees

Managed Pension Fund Contract. This is designed as a service for trustees of smaller-sized pension funds whose size does not permit them to obtain sufficient investment spread or who find the cost of direct investment management prohibitively high. Through the range of funds opposite, trustees can achieve a degree of spread which is only possible on a pooled basis.

COMPANY PENSION FUND
Company Pension Fund performance since launch (14.2.1974) to 31.12.1978 (with national gross income re-invested)

PROPERTY PENSION FUND
Property Pension Fund performance since launch (2.10.1975) to 31.12.1978

EQUITY PENSION FUND
Equity Pension Fund performance since launch (16.11.1977) to 31.12.1978 (with national gross income re-invested)

GILT PENSION FUND
Gilt Pension Fund performance since launch (16.11.1977) to 31.12.1978 (with national gross income re-invested)

DEPOSIT PENSION FUND
Deposit Pension Fund performance since launch (14.11.1977) to 31.12.1978

When providing for your own pension or advising others on pension matters, it will certainly pay you to consider the pension schemes Save & Prosper offer, both for individuals and groups.

Wide investment experience. At Save & Prosper we have acquired considerable investment experience over the past 44 years, becoming Britain's largest unit trust group. From this base we have developed new ways for investing in other types of funds as well as in unit trusts so that investors can achieve more objectives in simple and tax-efficient ways. As a result we are now also a major force in pensions, life assurance and annuities.

At 1st January 1979 Save & Prosper Group managed £923 million for some 700,000 investors.

Carefully designed pension schemes. The range of Save & Prosper pension contracts is a good example of our technical expertise in developing plans to meet investors' needs. We have been able to select the best features of existing contracts on offer, refine them and often incorporate our own innovations. The contracts are structured so that companies and members are both involved in the minimum of administration. In this way we believe we have pension schemes which are tailored to meet market needs with a high degree of precision and which offer good value for money.

Maximum tax relief. All our contracts are designed to take maximum advantage of all available tax relief.

Further information. For further details please consult your professional adviser or one of our branch offices throughout the country, or telephone our Customer Services Department on 01-554 8899. We have branches in Birmingham, Brentford, Bristol, Croydon, Edinburgh, Glasgow, Ilford, Leeds, Manchester, Newcastle-upon-Tyne, Nottingham, Plymouth and Southampton.

SAVE & PROSPER GROUP

UK NEWS

Cement price rise of 7.4% is expected

BY JAMES McDONALD
HIGHER INTERIM cement prices of 7.4 per cent by the British industry may be approved next Monday after an application by Rugby Portland Cement to the Price Commission for an overall weighted average price rise of 10.9 per cent.

Lord Garmoye joins Warburg

LORD GARMOYLE, a key figure involved in the Government's sale of part of its British Petroleum stake to U.S. citizens, is to join merchant bankers S. G. Warburg next month as an executive director.

CONTRACTS AND TENDERS

Tender Announcement for Nominated Sub-Contracts

The Government of the State of Qatar will shortly invite bids for the Nominated Sub-Contracts for the University of Qatar which is situated approximately 8 km north of Doha.

- 1. Engineering Systems
A. Mechanical
B. Electrical
2. Architectural Finishes
A. Joinery and Associated Works
B. Applied Finishes, Suspended Ceilings and Decorations.

Applications to participate should be sent as soon as possible, but not later than 22nd Jan. 1979, to the Technical Adviser to His Highness the Amir, The Amir's Office, P.O. Box 823, Doha, Qatar.

- 1. Engineering Systems
A. Mechanical 100,000,000
B. Electrical 50,000,000
2. Architectural Finishes
A. Joinery and Associated Works 90,000,000
B. Applied Finishes, Suspended Ceilings and Decorations 45,000,000

Table with 3 columns: Sub-Contract, Turnover QR, Document Price QR. Includes Engineering Systems, Architectural Finishes, Equipment, and Landscaping.

Interested firms should have the turnover shown in the table below for each tender and documents available at the Amir's Office for prequalified bidders at the prices listed.

THE HASHEMITE KINGDOM OF JORDAN

JORDAN ELECTRICITY AUTHORITY
SOUTH JORDAN TRANSMISSION DEVELOPMENT, STAGE 1
Tenders are invited for the design, manufacture, testing, delivery, erection, commissioning and maintenance of transmission lines and associated equipment for the following three tender documents.

Ireland urges new initiative on Ulster

BY STEWART DALBY
IRELAND'S Foreign Minister has urged Britain to launch a new political initiative aimed at breaking the stalemate in Northern Ireland.

Only Britain, which runs Northern Ireland by direct rule, could initiate this, he said.
"Despite the continuing suffering and violence the climate for reconciliation has never been more favourable."

Labour Party proposals likely to boost Tory popularity

BY ELINOR GOODMAN, LOBBY STAFF
THE LABOUR PARTY looks likely to give the Tories a boost this week in its campaign to brand Labour as a party dominated by extremists and divided in its own ranks.

Economy 'should just scrape by this year'

BY PETER RIDDELL, ECONOMICS CORRESPONDENT
THE ECONOMY should manage to scrape by in the next 12 months with a slight acceleration of inflation, moderate slowing in economic expansion, modest current-account surplus, and a small fall in the exchange rate, say the stockbrokers Phillips and Drew.

Bow Group calls for venture between BL and Japanese

BY KENNETH GOODING, MOTOR INDUSTRY CORRESPONDENT
A JOINT venture between BL (formerly British Leyland) and one of the Japanese car manufacturers should be encouraged, according to a paper published by the Bow Group today.

Retail inflation rate likely to hold steady

BY DAVID FREUD
THE ANNUAL RATE of retail price inflation is likely to have remained within the recent range of about 8 per cent last month, which should be indicated by new official figures to be published later this week.

Gearing up for the micro-chip

THE IMPACT of new technology on Britain will be felt equally in the Civil Service as in the private sector. This was recognised by Lord Peart, the Lord Privy Seal, in a speech made to the British Computer Society last week.

NEWS ANALYSIS
TECHNOLOGY IN THE CIVIL SERVICE
BY PAUL TAYLOR
such a complicated social security benefits system. At the core of most of the Government's major administrative operations there is now a computer.

Access offers cards to stores

BY MICHAEL LAFFERTY
THE ACCESS credit card operation is to offer credit cards for individual businesses, Barclaycard decided last year to operate pilot schemes for companies.

Stockbroker's writ against S. M. Chan

BY ANDREW TAYLOR
W. I. CARR, a London stockbroker, has issued a £200,000 writ against S. M. Chan (1973), the Hong Kong brokerage that collapsed at the end of last year.

FIGHT BACK AGAINST CANCER
IMPERIAL CANCER RESEARCH FUND
One of the ways you can help us NOW. Includes an image of a laboratory and a form for donations.

UK NEWS

LABOUR

Benn committee reviews future of Welsh mines

BY JOHN LLOYD

THE FUTURE of the South Wales coal industry, which lost £30m last year and is expected to lose at least as much this year, is to be debated tomorrow by a sub-committee of the Coal Industry Tribunal...

Unavailable Sir Kenneth Berrill, head of the Central Policy Review Staff (the "Think Tank") is also a member, thus ensuring that the Cabinet Office keeps in touch with developments.

In its paper, the board relied heavily on arguments that coals from the Welsh field were often virtually unavailable elsewhere in the UK...

The paper said that the cost of importing the coals required if the coalfield were run down would be much higher than the present subsidies needed to keep it going.

Although the union supports the Coal Board's call for increased investment, the two disagree sharply over a programme of closure that Mr. Philip Weekes, the South Wales area director, believes essential if the field is to be made profitable by the early 1980s...

The first pit selected by the South Wales Coal Board for closure is Deep Duffryn, in the Gwyn Valley. The board says that it is approaching exhaustion and loses £7.50 a tonne of coal produced.

The Welsh National Union of Miners has refused to agree to Deep Duffryn's closure and is appealing to the full board

against the area board's decision. The appeal will be heard on January 26.

Arbitrator

The union does not believe that the board will reverse its area's decision, particularly as Mr. Weekes is a part-time member of the full board, and is preparing to take its case to the Energy Secretary.

Mr. Eadly Williams, President of the Welsh miners, said at the weekend: "It's rubbish to say that there's no more coal left there. The valley's full of coal. If you chose that pit, the valley will die."

Mr. Benn does not enjoy being placed in the position of arbitrator over pit closures, a constant source of friction between the board and the union.

Last year he proposed a scheme whereby the union and board would decide jointly on pits to be closed. However, the union believed that to take the responsibility of deciding on pit closures would create possible breaches between its national and regional levels. It has not taken up the invitation.

The Government is committed to maintaining and expanding the coal industry in Scotland. Mr. Alex Eadie, Energy Minister with special responsibility for coal mining, and a former miner, said yesterday.

Project

The industry in Scotland had not been neglected in the past year, he said. "Just last month," the Government approved £1.5m to maintain the level of coal burned at the Kincardine power station—and this was in addition to the £35m over five years announced in 1977.

"A new shaft is to be sunk at Castlehill Colliery, which is part of the Longannet complex, and a new mine to join the complex is to be driven from Kinnell Colliery at Bo'ness.

These operations are to cost £33m, while another £37m is planned for the Munktonhall-Musselburgh Bay project, which is aimed at extracting a reserve of 100m tonnes of coal from under the Forth.

The Government is guaranteeing a long life for the coal industry in Britain. Scotland will get its fair share of that development.

Trailer men top profit league

By Our Industrial Staff

YORK TRAILERS, which makes truck trailers, tops what is claimed to be the first "profitability league" for the engineering industry.

The magazine Engineering Today, which compiled the list, chose to measure performance by net return on paid-up capital. Only public companies are included because of difficulties in obtaining details of private concerns' finances.

York makes a 55 per cent return, "a staggering performance in a market which is chronically oversupplied," according to the compilers.

The group has averaged a compound growth in net earnings of over 20 per cent in the past five years.

The electronics group Racal is reckoned to have the best all-round record with annual earnings growth of nearly 60 per cent in the five years, and 40 per cent return on capital.

Companies need not be in obvious growth industries to perform well. Midland Industries, for example, had annual earnings growth of 69.1 per cent and return on capital of 25 per cent in "the unglamorous business of drop-forging, tool-making and agricultural engineering."

No more than 5% without output deal, railmen told

BY NICK GARNETT, LABOUR STAFF

RAIL UNIONS were given a clear indication at the week-end by Sir Peter Parker, chairman of British Rail, that there would be no more than 5 per cent on offer for the next pay round unless it was attached to higher productivity.

Any flexibility round the 5 per cent must be achieved by a productivity deal acceptable to the Government. But Sir Peter stressed that money was available to do this, providing co-operation with the unions was agreed.

The possibility of severe difficulties for British Rail pay negotiations next year has been emphasised by the determination of the rail unions, which

have submitted claims for substantial rises, not to agree deals below the general level of settlements in private industry.

At the same time, it has taken almost a year of negotiations during this pay round to agree a 12-month productivity deal, backdated to last April. That deal has still to be approved by the Department of Employment.

Related to improved business performance, it will provide extra payments of about £2 a week. A deal giving similar-sized payments next year is unlikely to ensure that wage increases on the railways keep up with the private sector.

British Rail still faces difficulties from the separate productivity claim by ASLEF, the train-drivers' union. The union's executive meets today to discuss the possibility of sanctioning industrial action if its claim is not met.

The British Rail union working party looking at the claim, which is for separate cash payments related to what the drivers say is higher productivity since 1974, meets tomorrow.

Drivers on some Southern Region routes are threatening a 24-hour strike from midnight tomorrow in support of the claim. A further worry for British Rail is that the National

Union of Railwaymen has warned that if there is any extra across-the-board payments for train drivers, it too would be seeking further payments for its members.

Sir Peter, speaking on the BBC 2 programme On The Record said British Rail had budgeted for pay rises of 5 per cent and indicated that anything above this, unrelated to higher productivity, would lead to fare increases. Rail fares were raised yesterday by 9 per cent.

The railways, in general said Sir Peter could look forward to a period of prosperity but he warned that any "rush" up the pay scale could put British Rail "in trouble" again.

Shell Brent platforms hit by dispute

A DISPUTE has broken out between 300 offshore construction workers and contractors employing the men on three Shell Brent platforms.

Men aboard the Brent C and Brent B platforms have already been flown ashore and those working on the Brent A were expected to follow last night. The dispute, thought to concern the renewal of the current

offshore construction and hook-up agreement, arose on the Brent C, and men employed on hook-up work by the Wimpey, Brown and Root joint venture, were flown to Sumburgh on Saturday.

Then men employed by the Brent E, carrying out post installation modifications, stopped work in sympathy and

were followed yesterday by CJB Offshore Services' workers on the Brent A.

The Brent C installed on the oilfield in June is the fourth platform to be placed on the Shell-Esso complex and was expected to be in production by the third quarter of this year.

Although that programme will now be affected if the dispute becomes lengthy.

But a Shell spokesman said that the dispute should not affect production on the Brent A and B because the men involved were construction workers adding additional facilities and were not involved in production.

No comment was available yesterday from any of the contractors.

Government staff pay warning

By Our Labour Staff

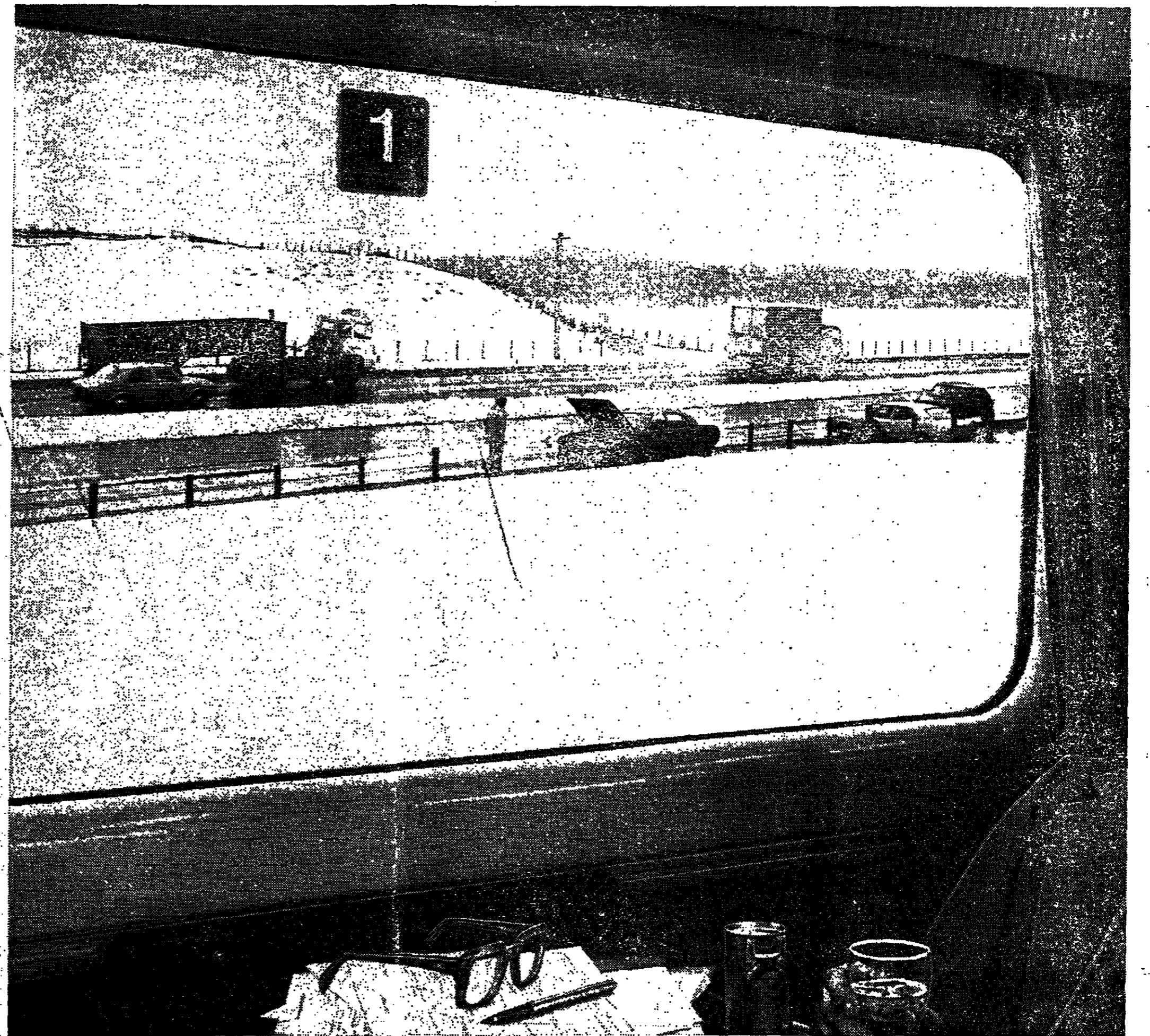
MR. WILLIAM McCALL, general secretary of the Institution of Professional Civil Servants yesterday attacked other union officials for taking a militant attitude on the findings of an independent pay comparability study for the Civil Service before the findings were fully known.

In what appears to be a reference to the Society of Civil and Public Servants, Mr. McCall suggests that premature publicity on the findings of the Pay Research Unit has done harm to the cause of the Civil Service unions.

The society has been holding regional meetings at which members have been told by officials that the Government could no longer plead ignorance to the pay differentials that have grown up between the Civil Service and private industry.

The findings of the unit, which is not empowered to make recommendations on pay levels, are still at a tentative stage but suggest that the Government might be faced with demands of up to 30 per cent, and perhaps more for some groups of civil servants.

Mr. McCall, writing in his union journal says all the information from the unit should be analysed before industrial action is planned if the Government is not prepared to fulfil its "obligations."



Private steel sector may switch sources

BY ROY HODSON

FAR-REACHING changes in the private sector of British steel-making, involving the mini-mills switching to new raw materials sources, are forecast in the latest issue of the Journal Metallurgist.

Mini-mill operators are said to be looking beyond the scrap steel market for future feedstock for their electric furnaces. Suggested alternatives include granulated blast furnace iron and pre-reduced iron.

A private sector steel industry scheme to build a plant on the Tyne, for the direct reduction of imported iron ore, was scrapped two years ago because of the cutback in world steel demand.

Private mini-mills in Britain, including the new 800,000 tonnes a year capacity Alpha works in South Wales, are contributing about 5 per cent of Britain's liquid steel output. They could easily double their output if steel demand improves.

The journal says that while there is much scrap steel available it is partly because of the inability of the British Steel Corporation to take up the quantities. Thus, any increase in demand for steel is likely to raise scrap prices—already back at 1976 levels of about 250 a tonne—and put the mini-mills at a disadvantage.

The British Steel Corporation is now completing two direct reduction ore plants at Hunterston on the Clyde with 800,000 tonnes annual capacity. Plans to keep them in mothballs during the steel slump are being reappraised.

If the plants are put into production later this year, or early next year, some of their production might be made available to the private sector steel companies. In any event the appearance of large tonnages of an alternative to scrap steel upon the British market would help hold down scrap steel prices.

Arguments

The 530 member companies of the British Scrap Federation, which have more than £150m invested in scrap processing facilities, have told the Government that the price of scrap steel is likely to continue to be directly dependent upon demand. Also there is a ceiling to the amount of scrap which could be recovered during a boom.

Those arguments are being considered by the mini-mill operators as they again consider whether to invest in a private sector plant for directly reducing iron ore or obtain feedstock by some other process.

Assemblies 'catching-up exercise in democracy'

BY ROBIN REEVES, WELSH CORRESPONDENT

ASSEMBLIES for Wales and Scotland are a catching-up exercise in democracy and, in conformity with the broad trend of government and administration in most other democratic countries, Dr. David Owen, the Foreign Secretary, said at the weekend.

Returning to the Land of his Fathers to address a "Wales for the Assembly" campaign rally in Llandrindod Wells, Dr. Owen pointed out that, among the EEC member States, Britain had the most centralised form of government, apart from France.

It contrasted unfavourably with Germany's Federal structure which had been strongly influenced by the UK when it was an occupying power immediately after the War. Italy enjoyed a successful form of regional government which had acted as a stabilising factor in relation to the problems affect-

ing its central government. Spain, which it was hoped would soon also be a member of the European Community, now also had a constitution providing for regional assemblies in 16 regions.

On the other hand, in Britain, central government had grown almost unchecked. In 1900, there had been 50,000 Civil Servants. Today, there were 570,000 in organisational structures ever more dominated by London.

The decentralisation of these areas of decision-making to elected Assemblies for Wales and Scotland was "a wise addition to democratic government, a major step, but a catching-up exercise in democracy." It fitted in with an international climate in favour of the citizen's concern to win back more control over his destiny and readjust the balance between bureaucracy and democracy.

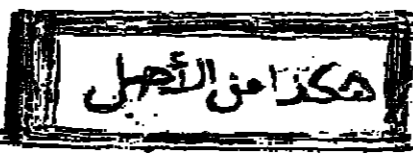
The right way to go about your business in winter

Fog, rain, ice, snow... But you can't afford to do business only when the weather is fine. When travel conditions are doubtful, Inter-City is the best way. With Inter-City, you know you'll get there in warmth. And in comfort. When it's foggy, your driver has an advanced system of signal lights shining clear to tell him what's ahead. On ice and snow, the train follows the

right lines as surely as if it's on rails. Guess why? No train is ever diverted to an out-of-your-way airport because of the weather. And next time you hear someone talk about Motorway Madness, remember it doesn't just mean the stupid things other people do on motorways. It could be the decision to take the motorway in the first place. When it's the last place you ought to be.



Have a good trip!

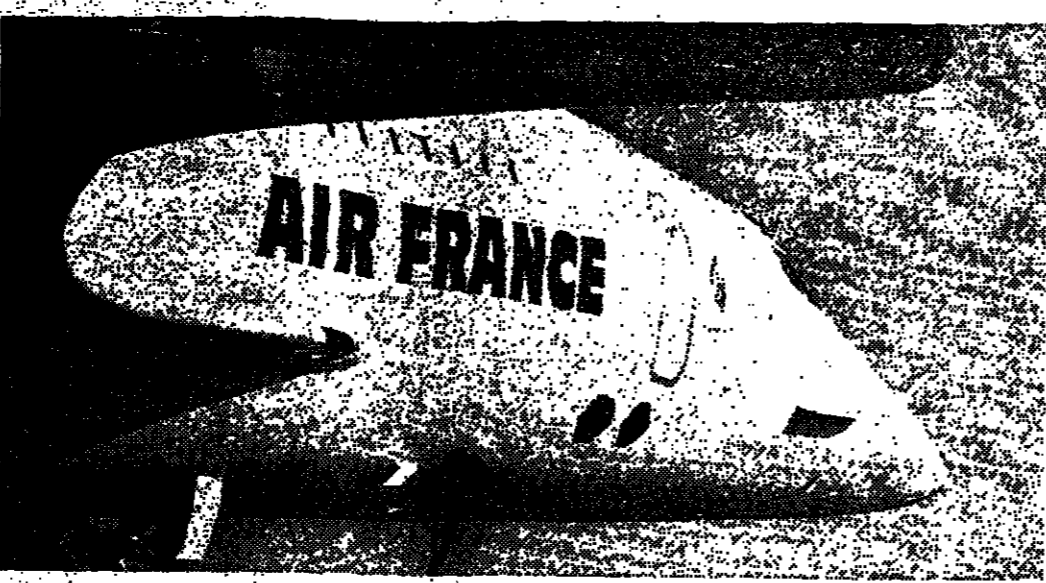


MANAGEMENT

Air France—taking off into an era of mass transport and cheap fares

BY MICHAEL DONNE

IN COMMON with other major European airlines, Air France is moving into an era of mass transport that will require some major changes in the airline's thinking, and will involve new types of aircraft, new fares policies and higher staff productivity.



"We do not as yet know the exact proportions in our fleet of A-310s and B-737s," says Mr. Giraudet. "But we are studying a high-density version of the Super B-4 with more than 300 seats, and we hope to have two aircraft of this type in service in 1979, on such routes as Cairo, Tel Aviv or Istanbul."

competitive modernisation. If we don't intend to reduce our standard of living, we must increase our efficiency by every available means.

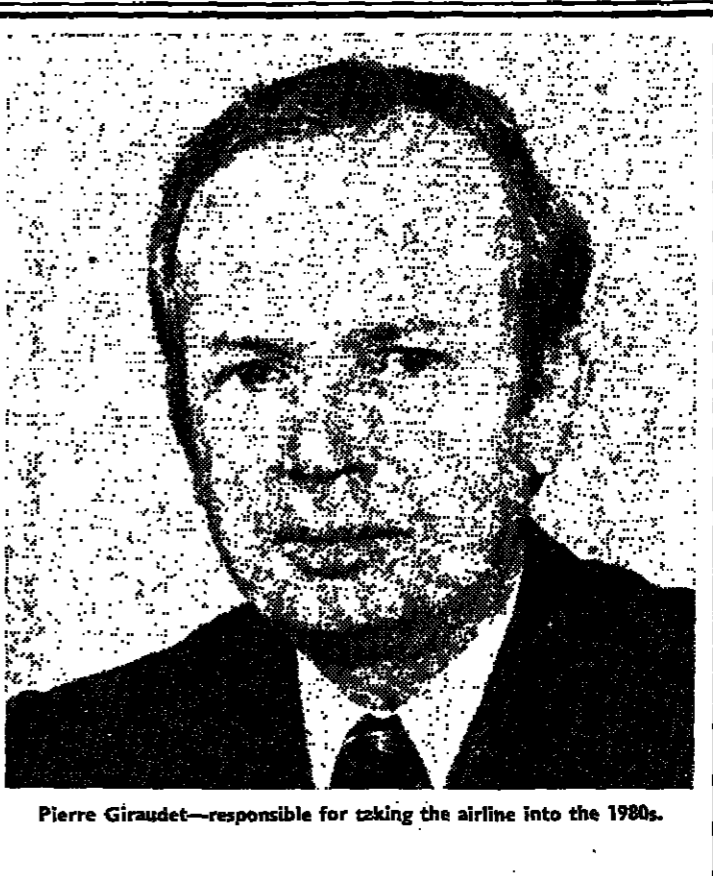
But during those 30 years, there were few changes in methods and products, and now they are no longer in tune with the modern market.

France's fleet planning, and he foresees the future being built round two basic aircraft types, the Boeing 747 Jumbo jet, and the European Airbus—the latter being the aircraft which made most money for Air France during 1978.

Traffic growth He is not opposed to the current American concept of stimulating traffic growth by increasing competition and cutting fares, but like many other European airline chiefs he is opposed to U.S. Government attempts to impose its ways on other countries, and especially the attempt to introduce "open skies" policies in all its new bilateral air agreements.

Efficiency While Air France might eventually be interested in any new short-range Joint European Transport (JET) venture, developed by Airbus Industrie, such an aircraft would have to fulfil two conditions. First, it would have to be as efficient as the Boeing 737, and the pilots would have to agree to two-man crews, in order to ensure Air France's competitive ability.

Future plans Mr. Giraudet has no doubts about the problems—and his plans to deal with them. "This is a period of change," he says. "I think the next two decades will be the decade of mass transport, with very big aircraft, very cheap fares, and the whole population will have access to air travel."



Pierre Giraudet—responsible for taking the airline into the 1980s.

Dealing in a baffling commodity

COMMODITY markets appear to have a special fascination for "academics"—economists in particular. They have been having a field day since the OPEC-inspired oil crisis raised the spectre of commodity cartels for other vital raw materials. Learned papers on the prospects for cartels and ways of stabilising commodity prices have been pouring out from universities, research institutions and other centres of learning.

Concorde loss Mr. Giraudet is also concerned about the future of Concorde. "Up to the present, Concorde operations have not proved profitable. We do, of course, have a Government subsidy, but we have to accept a proportion of the loss. We would be interested to come to terms with the Government on this."

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Technical Page

EDITED BY ARTHUR BENNETT AND TED SCHOETERS

METALWORKING

Hardeners and tempers tools and blades

A CONTINUOUS fluidised bed hardening and tempering line is to be set up at Howland Rotator Company's Harrison factory in Norfolk.

paratively small floor area and will be capable of handling 14 tonnes of Rotator blades per hour.

Under high pressure

ONE OF the more unusual services now available on a subcontract basis is the production of metal components by the hot isostatic pressing process.

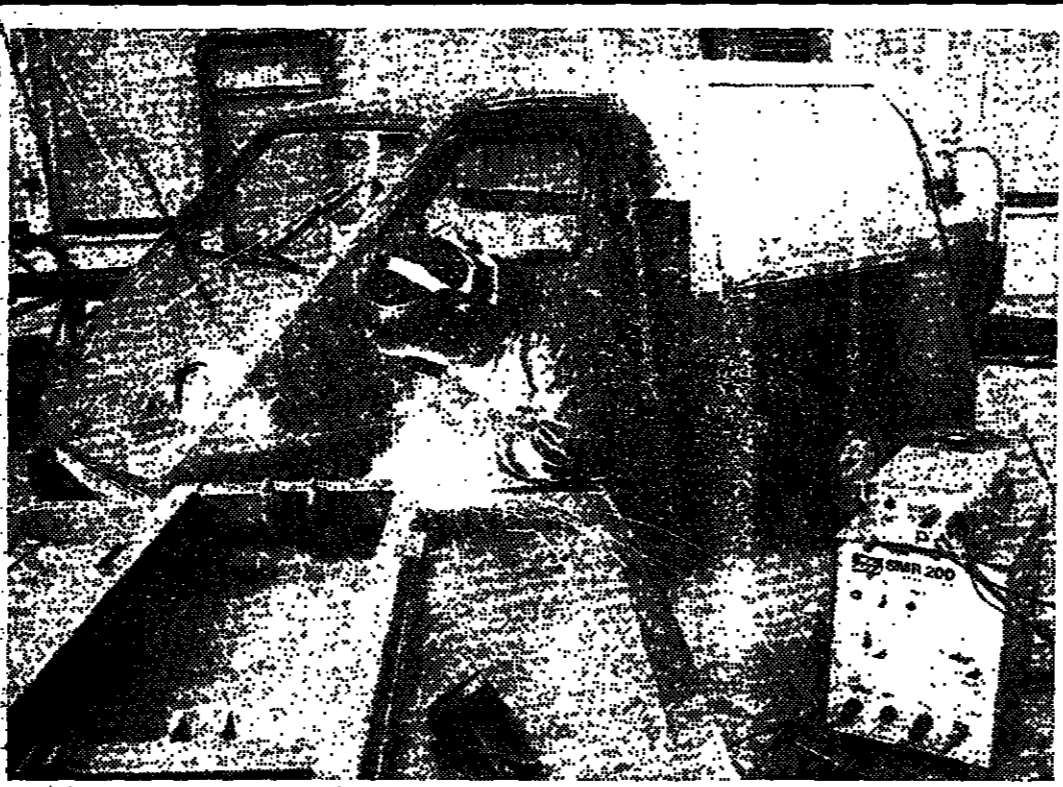
movement of 164 inches. Ram speed is infinitely variable in the range 10 to 160 feet per minute, and automatic table cross feeds are set between 0.008 and 0.2 inches per stroke of the ram.

Hydraulic shaper

SAID TO be ideally suited to heavy duty shaping operations, such as squaring up large blocks of tool steel prior to die-sinking, is the hydraulic Shanks-shaper Model 7037, marketed by Machine Tool Agencies, Wedgnock Industrial Estate, Rothwell Road, Warwick (0226-48861).

COMMUNICATION

Designed to answer and record THE FIRST of a new range of British Post Office approved telephone answering and recording machines—the 6,000 series—has been announced by Eurofone. The range will include remote access and microprocessor controlled machines.



Fabrication of bodies for the Ant a specialised three-wheeled vehicle is being carried out at BTE Engineering's Blackburn, Lancs, works with the aid of BOC's MIG welding equipment. Bodies for the Ant

range from tipper refuse collectors and water tankers to milk floats. About half the output of Ant vehicles is sold to UK municipal authorities, the rest going to the Middle East, Nigeria and the West Indies.

HANDLING

Packs pallets fast, but with care

HIGH SPEED seems to be the criterion for packing or unstacking loaded pallets of products contained in cartons, trays, drums, crates or ready shrink-wrapped, yet it is important that no damage occurs to the packaged product.

INSTRUMENTS

Measures the flow

FLOW OF liquids and effluents through open channels or across weirs can be accurately monitored with a new non-contacting flow meter. The adjustments within the flow meter are extremely simple and it can be installed and calibrated in either a new or existing location, within 30 minutes.

FINISHING

New liquid compound

RESEARCH AND development into new compounds is its continuing policy, says Osro, Trubro House, Mark Road, Hemel Hempstead, Herts (0442-42181).

Atlas Copco compressed air systems.

A force put to work for you. A new VTI100W word processing video terminal has a detached keyboard, double-width and -height characters, smooth scrolling, and a variety of functions—reverse video, blinking and underlining, and normal video at dual intensity.

Computing

Lowers cost of word processing MULTI-TERMINAL series of WS200 word processing computer systems and a new single dual user system, the WS80 have been launched at Syntopex VI, the word processing exhibition that gathered at the Gateway Convention Centre in St. Louis, U.S.

Seeking British goods

TWO Canadian missions looking for British-made toys, hardware, and gifts products, arrive in the UK on January 23 and February 5.

PROCESSING

Filtering the water

EQUIPMENT which has been used for many years in a wide variety of municipal and industrial water and effluent treatment plants in the U.S. has now been introduced to the UK and European market by Environmental Elements (United Kingdom), Nicholson House, Nicholson's Walk, Maidenhead, Berkshire SL6 1LD (Maidenhead 20411).

INSTRUMENTS

Measures the flow

FLOW OF liquids and effluents through open channels or across weirs can be accurately monitored with a new non-contacting flow meter. The adjustments within the flow meter are extremely simple and it can be installed and calibrated in either a new or existing location, within 30 minutes.

Big can also be beautiful

BY GEOFFREY OWEN

"MERE SIZE is no offence." This principle, enunciated as far back as 1920, has always been a cardinal element in the U.S. antitrust laws. In considering merger proposals, for example, the antitrust agencies and the courts are supposed to concern themselves with their impact on competition, whether the acquiring company has a turnover of \$50m, \$500m or \$5bn, strictly speaking, irrelevant. Yet in practice the sheer size of companies has been and continues to be a matter of concern to the authorities.

During the 1960s there was anxiety about conglomerate mergers which were outside the antitrust net because they did not directly affect competition, but were thought to contribute to an excessive concentration of power. Conglomerate mergers then went out of fashion but in the past year or so there has been a remarkable revival of the very large take-over or merger. A recent example is the proposed union between Firestone (sales of \$4.3bn) and Eaton Corporation (sales of \$2bn).

Some of these deals have been attacked on antitrust grounds, but officials in the Justice Department evidently feel that the antitrust net because they did not directly affect competition, but were thought to contribute to an excessive concentration of power. Conglomerate mergers then went out of fashion but in the past year or so there has been a remarkable revival of the very large take-over or merger. A recent example is the proposed union between Firestone (sales of \$4.3bn) and Eaton Corporation (sales of \$2bn).

Whether anything will come of this proposal remains to be seen, but it is an interesting example of how competition policy can get entwined with a general concern about economic power. In an extreme form this can take the form of trying to preserve small companies and fragmented industries for their own sake, ignoring any efficiency gains that might result from the creation of larger groups. An industry in which there are ten competing firms, none with more than 15 per cent of the market, is thought to be better, on social grounds, than one consisting of four companies, the largest with 40 per cent. There have even been proposals that oligopolistic industries should be "de-concentrated" in such a way that no company could ever hold more than 12 per cent of the market.

For the most part these theoretical ideas have been confined to academic studies and recommendations to congressional committees; the antitrust laws themselves have been applied with a fair degree of pragmatism. But the antitrust enthusiasts remain unhappy about the size and influence of

TO THE uninitiated the resignation of Lord Harris as Minister of State at the Home Office to become chairman of the Parole Board looks like a piece of blatant self-appointment; the more so since for the past four years he has been the Minister responsible for prison administration and in particular for the workings of the Parole Board. But if the Home Secretary's selection of his junior Minister to fill the vacancy of a crucial institution within the prison administration is open to that kind of objection, there is much more to the appointment than that bald political manoeuvre.

That the prison system is in crisis was amply demonstrated by the setting up by the Home Secretary last November, in a state of high urgency, of an inquiry under the chairmanship of a High Court judge. For some time prison officers have been in ferment over their pay and conditions of service, aggravated by the growing inmate population leading to overcrowding of almost all our penal establishments.

One of the basic ingredients of the discontent is their precise role in the modern penal system. Disillusionment over efforts to rehabilitate prisoners plus public demands for tighter security and containment of

prisoners have made staff-inmate relationships difficult. The Parole Board was set up by the Criminal Justice Act, 1967; it had a thoroughly pragmatic foundation, in that it was conceived as a sensible method for reducing the prison population. Its authors cared little for, and paid no attention to, the philosophical objections to a system that gave fresh arbitrary powers of release to the executive over prisoners sentenced by the courts.

For a variety of reasons parole has been at best only a qualified success. It has meant that increasing numbers have achieved their liberty earlier than otherwise would have been the case—but at what cost? One of its defects is that it has introduced a new element in staff-inmate relationships that has fed the current discontent among both prison officers and prisoners. Hopes raised by the prospect of early release have frequently been dashed, to the accompaniment that prison staff are responsible for failure.

It is at this point—ten years on from the beginning of parole in this country—that the Home Secretary has the complete confidence of the prison service if further worsening of staff-inmate relations is to be avoided. Any suggestion that the new appointee might strike out on a new policy that ostensibly

advocating at least a review of the system, preferably by the Home Secretary's Advisory Council on the Penal System. But each approach has been officially rebuffed. Lord Harris has been associated with it, not necessarily himself sympathetic to, such official attitudes.

The more radical critics of the parole system assert that prisoners should be served in a subject only to a remission of a fixed proportion of the sentence; and that the privilege of earlier release by way of parole licence is giving to the executive too much power in interfering with the courts' decision and is moreover discriminatory in its application as between prisoners. That movement can hardly be advanced by Lord Harris's appointment to the chairmanship.

The more moderate reformers, likewise might not find much comfort in No one doubts the liberal instincts of Lord Harris; he is acknowledged to be on the intellectual Right of the Labour Party and shares with that segment of Labour politicians a distinctly radical approach to issues of

THE WEEK IN THE COURTS

BY JUSTINIAN

contemporary problems of the prison service. He has also shown himself to be an adroit administrator, sensitive to the issues that have bedevilled the prison system over the past few years. He has visited penal establishments widely and made contact with both staff and prisoners. If anyone could be said to have the confidence of the prison service, Lord Harris has all the qualities for achieving just that.

But there will be no corresponding cheer from those concerned generally with penal affairs. On this score Lord Harris sets out on his task with a number of handicaps, not least of which has been the reluctance of the Home Office to envisage a radical rethink of parole policy. Penal reformers have been

ENTERTAINMENT GUIDE

OPERAS & BALLET

- COLESIUM CC. 01-240 5258. Repertoire 01-238 5161. ... THE ROYAL BALLET ... THE ROYAL OPERA ... THE ROYAL SHAKESPEARE COMPANY ...

CINEMAS

- ARC 1 & 2 SHAPPEYERS AVENUE, 836 0861. ... THE GODFATHER PART II ... THE GODFATHER PART I ...

Contrasting publications for the connoisseur

"As I saw it, he was worth £2m at that point, even if he were to finish nowhere in the 2,000 Guineas. But on potential you could put an extra million pounds on his head at least, that is the rate of £3m. Had he gone on to win the Guineas, I estimate he would be worth £4m, definitely. And if he had taken the Epsom Derby as well his value would have jumped to £7m, possibly £8m." And after

RACING

BY DOMINIC WIGAN

Volume XXXII is a necessity for most practical breeders who have to arrange matings, as it is the only standard work of reference which allows one stallion to be compared with another. Full pedigrees to the fifth generation, with particulars about ownership are the most vital features. In addition there are a number of indexes which cannot be found elsewhere. For example, the 156 leading stallions featured in the book, are specially indexed under their own sires. Another index lists sires, horses and mares with two or three generations in the stallion pedigrees.

that you had the Irish Sweepers Derby and if he had maintained an unbeaten record, the sky was the limit. I saw him as the finest colt since Nijinsky. The Sean P. Graham Racing Annual is available through W. H. Smith and other leading booksellers.

TV/Radio

- 5.05 John Craven's Newsround. 5.10 Blue Peter. 5.40 News (London and South-East only). 5.55 Nationwide. 6.20 Nationwide. 6.30 Question of Sport. 7.20 The Rockford Files. 8.10 The White Tribe of Africa. 9.00 News. 9.25 The Monday Film: "The Carey Treatment". 11.00 Play School. 11.40 Weather/Regional News. All Regions as BBC-1 except

F.T. CROSSWORD PUZZLE No. 3,865

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

- ACROSS 1 Island finds chemical firm in cunning surroundings (6) 4 Pleasurable gambles about a debt (8) 10 Girl has a fellow to tea, we hear, but remains unyielding (7) 11 Get together with a nice mob perhaps (7) 12 Knocks about the yard (4) 13 Prosperous, unlike Achilles (4-6) 14 A girl to see in the French Riviera resort (8) 15 This house is underground but shelters a Lord Mayor (7) 16 Lists always to gossip (7) 17 Boss takes ten to the workroom (6) 18 Prosaic and avoids the highway (10) 19 Spicy mark of authority (4) 20 I can maybe see mine adversaries (7) 21 Plan for underhand essayist (7) 22 Greek general takes to flight (8) 23 When tempers become thus, there may be an outburst (6)

CLASSIFIED ADVERTISEMENT RATES

Table with columns: Description, Single per column cm., Double per column cm. Includes categories like Commercial & Industrial, Residential Property, Appointments, Business & Investment, etc.

THE ARTS

Ronnie Scott's

Cedar Walton

by KEVIN HENRIQUES

It is exactly three years since the Cedar Walton quartet first played at Ronnie Scott's. Then it was enthusiastically and deservedly acclaimed as one of the most refreshing and hard-driving modern jazz units to have appeared at the club.

Maybe the excitement of that initial appearance conditioned the ear to expect something extra-special this time but in truth the latest Walton quartet is not as impressive overall. Previously its collective attack was hefty. Now it sounds reduced and not so cohesive.

Elizabeth Hall

Marius May

by NICHOLAS KENYON

"Mainly Slav" is an unimpeachable title for a concert series, and (as Dominic Gill pointed out on Saturday) this year's season of chamber music promoted by the agents Harrison (Barrett) and Ingpen and Williams in the Elizabeth Hall contains little unusual in the way of Slavonic music.

Friday's contribution to what we might retitlle the Not Slavishly Slav series was a recital by the formidable young British cellist Marius May, with the American prizewinner in the 1978 Leeds Piano Competition, Craig Sheppard.

National clarinet competition for young people

What is said to be the first ever national clarinet competition for young people is to be held in the spring by Ashtington Festival, Ashington, at 17 people between the ages of 17 and 23 who were born or are living in Great Britain.

The competition will be held in two parts, preliminary stage April 16, 17 and 18 at the Sinfonia Centre in Newcastle upon Tyne, and for the six finalists, a second stage on May 16 during Ashtington Festival in Northumberland.

RUGBY UNION BY PETER ROBBINS

The Welsh formula for success

AS ENGLAND struggle to discover reasons for their persistent failure over the years one is bound to ask why Wales have been so very successful in the same period.

That success has been hard earned and I suspect that the English attitude to the Welsh has not changed since my day—a grudging respect tinged, perhaps, with a little envy.

An important year in Welsh rugby was 1964, when Wales lost to South Africa in Durban by 24-3. It was considered a national disaster and at the Welsh AGM there was a proposal to set up a committee to make recommendations on the state of the game in Wales.

Both the Rugby Football Union and the Welsh Rugby Football Union set up advisory panels as long ago as 1964, but the Welsh decided that coaching should be identified with the

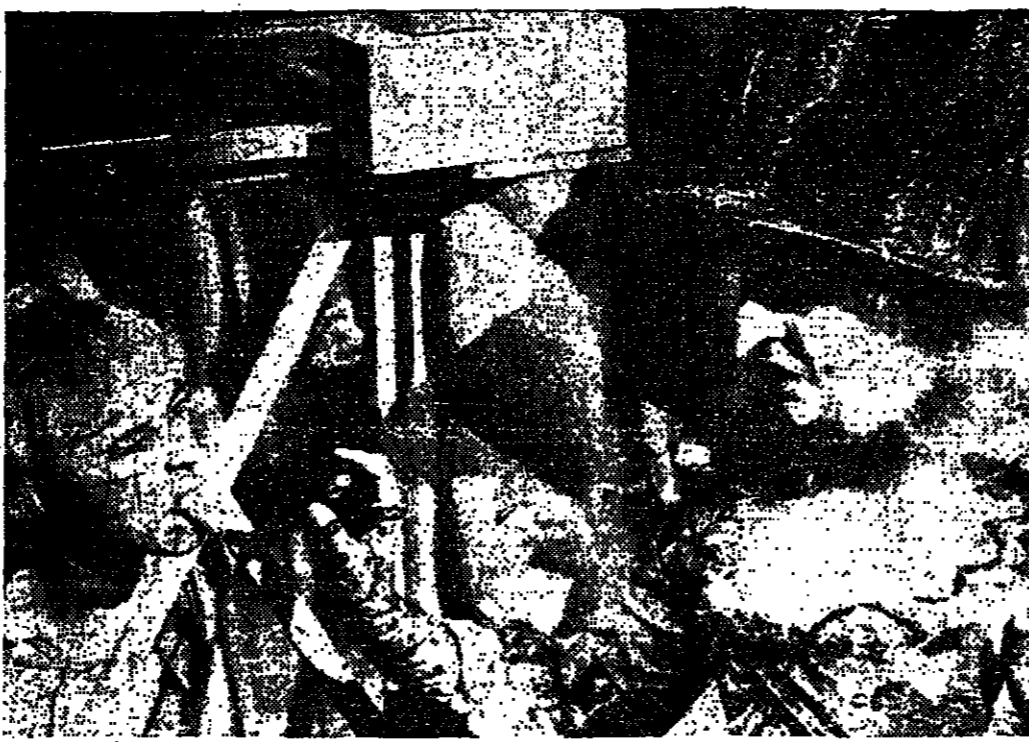
Walton thoughtfully explored the choral possibilities of several of his own compositions and other numbers, notably "I didn't know what time it was," with a deep, searching penetration. As an accompanist his simple accents (behind bass solos in particular) were impeccably adept.

Opposite the main attraction and making her Scott club debut is an attractive young singer from New York, Pamela Knowles, another of those vocal specialists who invest quality songs with a strong jazz flavour. Powerfully voiced with a big range she runs the gamut of numbers from the lusty "Dr Jazz" to the sophisticated "Sophie's Song" (no, not "Send in the clowns").

attacked with such unquenchable vigour that a string broke in the first movement; May's recovery was swift and efficient. Two technical points worried me continuously. One (perhaps a fault of instrument rather than player) was the pervasive unevenness of timbre across the strings: a move to a higher position on the lower strings jerked the sound in a way that even May's highly musical colouring could not disguise.

At the piano, Craig Sheppard was reticent to a fault, making such a point of his unobtrusiveness as to obtrude all too frequently; we are surely meant to hear the coda of the slow movement in Schubert's Arpeggione Sonata (for it is one of the few great moments in a work which never manages to live up to the promise of its first eight bars).

The chairman of the jury will be Denis Matthews and other members will include Sidney Fell, Timothy Reynolds, David Haslam and Graham Evans. Applications for entry and full details of the competition are available on January 20, from Ashtington Festival, c/o Leisure and Publicity Department, Wansbeck District Council, Wansbeck Square, Ashtington, Northumberland. Closing date for applications is March 1.



Claire Powell and Ann Howard

Leeds Grand Theatre

Hansel and Gretel

The case against Hansel and Gretel is easily made out—it has been found sentimental, sub-Wagnerian, musically too elaborate for the simplicity of the tale, characterised in clichés, a piece of kitsch, aimed not so much at German children as their nostalgic elders.

Her pretty, grey crinoline and powdered wig perhaps helped to allay fears; lacking crone's rags, she could not be that bad. However, this was one of the few mildly jarring notes. If the conventions are being followed, with a charming Sandman (Susan Lees) in dressing-gown and night-cap, with a delightful angel chorus from local Leeds schools, with the parents as pipe-puffing peasant and tolling wife, then to make the Witch quite such a creature of fantasy breaks the Grimm Brothers' atmosphere.

Festival Hall

Terabust, Schaufuss, Connor, Jefferies

A fine clutch of dance performances at the week's end lightened our frozen lives, with Elisabetha Terabust and Peter Schaufuss in Festival's Nutcracker, and Laura Connor, Stephen Jefferies and Graham Fletcher, in Fille at the Opera House.

Terabust's characterisation of Louise, heroine of The Nutcracker, is a portrait of a jeune fille bien élevée of quiet charm. Her dancing shares something of this same decorum, touched with a youthful lyricism in the snow-scene duet, and most delicately stated in the last act grand pas de deux (though one day Festival will come to its senses and do decent homage to Irving by restoring the glorious original text).

From Peter Schaufuss came the beautifully poised bravura we have come to expect from this outstanding artist. The characterisation calls for a certain shyness, which Schaufuss assumes without seeming namby-pamby. In the solo of the young man's truer personality shines out with splendid physical

last Friday; and Miss Howard was rewarded with an enthusiastic torrent of boos when she appeared for her curtain-call, sparring in a green spotlight.

Under David Lloyd-Jones, the score becomes much less Wagnerian than its reputation. Certainly, there are strokes of Wagner. There is a mutter from the Rhinegold giants in the forest and the Lohengrin prelude violins appear just before the Dream Pantomime, which perhaps has a touch of the Good Friday music in it (Humperdinck, after all, actually composed some scene-change music for the first performance of Parsifal).

JOHN WARRACK

Coliseum

Tosca by ELIZABETH FORBES

Tosca and good taste may appear a contradiction in terms, but the current revival of Puccini's opera by ENO at the Coliseum can best be described as tasteful. This is not to imply that the performance is pallid or lacking in guts; on the contrary, there is plenty of full-blooded singing and playing.

Then Ian Reid, who conducts, shapes the introduction "Recondita armonia." Cavaradossi's first-act aria, with special sensitivity. Geoffrey Pogson, making his debut with the company on Friday night, sings the piece in a reflective, elegiac style very different from the anguished and passionate manner with which he recalls Tosca's kisses and caresses in the last act.

As Tosca, Ava June is particularly effective in the scene with Cavaradossi in Sant' Andrea; she uses her jealousy as a weapon in the flirtatious skirmishes with her lover, while the teasing tenderness of the exchanges between the two carries absolute conviction. Miss June can also rise to the moments of high drama; she does not need to rush around the stage or wring her hands in order to convey the depths of her suffering during the torture of Cavaradossi or to make plain her disgust and hatred for Scarpia—it is all done with the voice. She sings "Vissi d'arte" very simply, phrasing the subsequent appeal to Scarpia's pity with touching humility.

JOHN WARRACK

reasoning intelligence that makes her such a fine Marschallin is out of place in Tosca's emotional character. Neil Howlett's firmly-sung Scarpia, though somewhat lacking in menace, radiates a positive truth in cruelty for its own sake that is a very adequate substitute. If he makes less impression than he might in the Te Deum, that is the fault of the distracting entrance, from a stage box, of the Cardinal's

procession. Otherwise any rough edges in John Blatchley's production have been smoothed down satisfactorily. The minor roles are well taken—the credulous and superstitious Sacristan of Harold Blackburn is a small masterpiece of character sketching—while chorus and orchestra despite, in the former case, depleted numbers, contribute an appreciable share to the effectiveness of the performance.



Ava June and Geoffrey Pogson

Purcell Room

Webern Festival—5

The fifth concert of the London Sinfonietta's Schubert/Webern series on Friday evening mixed the two composers more thoroughly than before: a long, well-balanced programme which punctuated his basic Webern theme with Schubert part-songs for an accompanied male voice. Part-song was never Schubert's most rewarding field; but the Sinfonietta unearthed some worthy gems nonetheless—a splendid "Die Nachtigall" of 1821, a wonderfully luminous late setting of Schöber's "Mondenschein" and a jolly "Fränklerl" that could have come straight out of Carmina Burana.

It was specially intriguing once again to hear the distillation of influences in the earliest Webern: in his first known work, two brief pieces for cello and piano (the cello was Webern's own instrument), dating from 1899 when Webern was only 14, remarkably accomplished essays shot through with a delicate performance of Strauss, Strybin and Saint-Saens; and in two teenage songs from 1900 and 1902, "Wolkennacht" and "Hochsommernacht," the first particularly of unmistakably Wolfian bitter-sweet ambiguity, and the second, a duet for soprano and tenor, in strict canon—a tonal foretaste of one of Webern's favourite later atonal devices.

The ten Stefan George songs op. 3 and 4 were originally conceived as two sets of seven songs, differently ordered, and

it was in this earlier form that Phyllis Bryn-Julson sang them here, including in each sequence the pair of songs finally rejected. Webern's eventual choice and ordering is probably better ("Kahl reckt der Baum" in particular ties a neat knot at the end of op. 3 than "Im Morgentann," and the two rejected songs of the second set are surely of slightly lesser worth); but Miss Bryn-Julson delivered both with impeccable roundness, warning (as she often does) a little slowly, but finally achieving in the last seven songs the simplest, finest instrumental detachment and calm purity of tone.

Of the instrumental works, we heard the two sets of tiny fragments which frame Webern's "miniature" period from 1910 to 1914, the Four Violin Pieces op. 7 and the Three Little Pieces for cello op. 11—each one a living crystal, exquisitely polished, perfectly formed, and on this occasion, in fine performances by Nona Tiddell and Christopher van Kampen with John Constable. The String Trio op. 20 was another work given in its earliest "unauthentic" form, here with its first two movements reversed, and with the addition of a reconstructed finale—interesting, but odd, uneasy effect. The well-known Quartet op. 22 for violin, clarinet, tenor sax and piano was played straight and unaltered: an enthusiastic performance, a shade less assured

in its ensemble and pacing, but thrown off with nice spirit and style.

DOMINIC GILL

RSC Aldwych advertisement. TONIGHT TOMORROW 7.30 Bronson Howard's 1870 American comedy "SARATOGA" "An irresistible, delightful evening" "Another in the RSC's line of seasonal treats" "Tremendous fun" "The whole evening is a holiday, one of the RSC's golden nights" 01-836 6404

BOXING BY TREVOR BAILEY

Champ from the welding shop

MY ARRIVAL at the Chrysler factory, Dunstable, last Thursday coincided with the afternoon tea break. A small group from a truck assembly line were enjoying the rest.

There was nothing unusual about the talk or dress of the workers I met, except that the one coloured member happened to be the reigning welterweight champion of Europe and Great Britain: strangely almost unknown Henry Rhiney.

Seeing him as just another, popular member of the workforce, I found it difficult to believe that this was the man who knocked out Josef Pechar with a copybook right uppercut to take the European title in December and has been British champion for the past two years.

Rhiney is softly spoken, shy, completely unmarked, shrewd and genuinely modest. For nearly all his professional career he has worked full-time in the factory, where he has never asked for or received special favours.

work has provided independence and the knowledge that, if he failed to make it in the ring, he could still support his wife and children.

Unlike so many boxers, for whom money is "easy come, easy go," Henry has learned to appreciate real values and the need to provide for the future of his family, which is why he is still earning £78 a week as a spot welder before he meets Dave Green to defend the European title at the Albert Hall on January 23, for which he will receive the largest purse of his life.

Henry was born in Montego Bay and brought to England by his father when aged 15. His determination that he was not over-matched. Initially he did not make a great impression. In spite of his technical proficiency he lacked the charisma of a Dave Green.

For Henry it was no quick way. He is 27 and has had more than 50 fights as a professional. The long apprenticeship has meant that Henry has absorbed far more ringcraft than most

known about boxing—and, one suspects, much about life as well.

For Jack Henry represented the dream of every coach: a pupil with exceptional talent who was also prepared to work and train hard and eventually to win through.

Apart from Henry's balance and very fast reactions, what impressed Jack in the early days and convinced him that he had found somebody special was the boy's eye for distance and his ability to learn combinations of punches.

Henry eventually turned professional and was fortunate to have as manager John Barclay, who made sure that he was not over-matched. Initially he did not make a great impression. In spite of his technical proficiency he lacked the charisma of a Dave Green.

For Henry it was no quick way. He is 27 and has had more than 50 fights as a professional. The long apprenticeship has meant that Henry has absorbed far more ringcraft than most

of his contemporaries, has developed an exceptionally sound defensive technique and has a classical left-hand jab, his favourite punch.

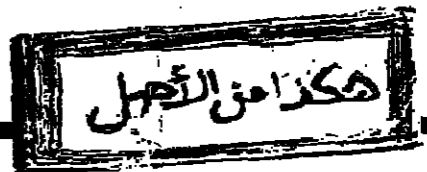
He is a highly proficient, thoroughly professional boxer, able to out-box, out-manoeuvre and out-think his opponent. Significantly, he has won three of his four successive championship fights by a knock-out.

Whatever the outcome between the bustling Green and the counter-punching of the elegant Rhiney, it should provide an outstanding contest. If Henry wins, his manager will be able to arrange for him either to defend his European title in France for another £20,000 or to take Green's place in a shot for the world championship.

In an era when it is fashionable to say that a mean streak is essential for a sporting champion and where letting the end justify the means is accepted, it is most satisfying to find a new boxing hero, who is an honest, non-swearng, unassuming and hard-working family man, a credit to boxing and to his race.

FINANCIAL TIMES SURVEY

Monday January 8 1979



Diesel Engines

The world diesel engine industry is set for a period of rapid growth. With its well-established advantages of fuel economy and durability, the diesel engine is likely to displace other forms of power, particularly in countries such as the U.S. which are having to adjust to the new era of high energy prices.

THE DIESEL engine represents one of the most attractive opportunities for capital goods producers over the next decade. In an era of high oil prices and prospective energy shortage the diesel's well-established characteristics of fuel economy and durability should enable it to expand its share of existing markets and to win new customers who have in the past relied on other forms of power, particularly the petrol engine.

The biggest areas of potential growth is undoubtedly the U.S., where the shift from petrol to diesel is already under way, but there are also opportunities for new business in Europe and Japan, especially if the diesel-powered car gains in popularity as much as some forecasters believe. In the developing countries demand for diesel engines, both in electricity generation and in a variety of other industrial applications, is expected to grow rapidly, if erratically, over the next few years.

Competition

More than 250 diesel engine manufacturers throughout the world, making some 5,000 different models, are competing for a market believed to be worth over \$15bn a year. There is not a great deal in common between a tiny 3 hp engine used to power a small irrigation pump and a huge slow-speed diesel installed in a giant oil tanker. Growth rates vary considerably from one sector of the industry to another. One sector, in particular, the manufacture of large

engines for marine propulsion, has been hit hard by the world-wide slump in shipbuilding. Manufacturers of this type of engine have been forced to look for other markets and they have devoted much effort to selling stationary engines for power generation; there is a good deal of over capacity in this part of the industry.

Another depressing factor has been the sharp downturn in demand for diesel engines in the Middle East and some other oil-producing countries such as Nigeria. There was a remarkable boom in these markets in 1974-75, bringing a sudden upsurge in business to manufacturers of diesel engines and products incorporating diesel engines, such as generating sets. As these countries became oversupplied or started running into financial problems, the tap has been suddenly turned off and some suppliers have found themselves with large stocks to dispose of. The Middle East remains an important market for the medium and long term, but the growth will be less hectic than it was in the period immediately following the oil price increase of 1973; customers, too, are likely to be more discriminating in their choices of suppliers.

Yet despite these difficulties the overall outlook for the world diesel engine industry remains bright. Studies commissioned by the Business Intelligence Program of SRI International, the U.S.-based consulting and research organization, suggest that demand outside the Soviet bloc and China will rise by an average of 8 per cent a year between 1976 and

The industry has big potential for growth

By Geoffrey Owen

1986. Unit sales will double from 5.5m to some 12m engines and the value of sales will rise from \$15bn to \$35bn.

Within this global figure there will be wide variations between the different parts of the industry. The number of engines supplied to the farm machinery industry is unlikely to show much growth. There will, however, be a tendency for the average hp in farm tractors to rise and agriculture will remain an important outlet for the diesel engine producers.

The most spectacular growth is expected to occur in the automotive field, covering cars as well as trucks. Although there are great uncertainties about technical developments, government regulations and customer reaction, demand in the automotive sector is expected to rise by at least 10 per cent a year and perhaps as much as 15 per cent. It is this part of the industry which has aroused the greatest excitement in the past year or two; engine

makers and component suppliers are making ambitious investments in new capacity and in new sales organisations to take advantage of the expected growth in demand.

The main focus of attention is the U.S. where in the lower horse power ranges — below about 300 hp—the diesel is much less firmly established than it is in Europe or Japan. The price of petrol has been and still is relatively low; small petrol engines are produced in enormous volume and in some applications are almost a throw-away product. Thus there has been little incentive for the use of diesel engines except in such areas as long-distance trucks, heavy construction equipment and tractors where ruggedness, durability and fuel economy are needed; rail traction and power generation are also important markets in the U.S. for larger engines. But the need for greater fuel economy is beginning to be appreciated more widely in other sectors

and the diesel engine in the U.S. seems set for a period of rapid growth.

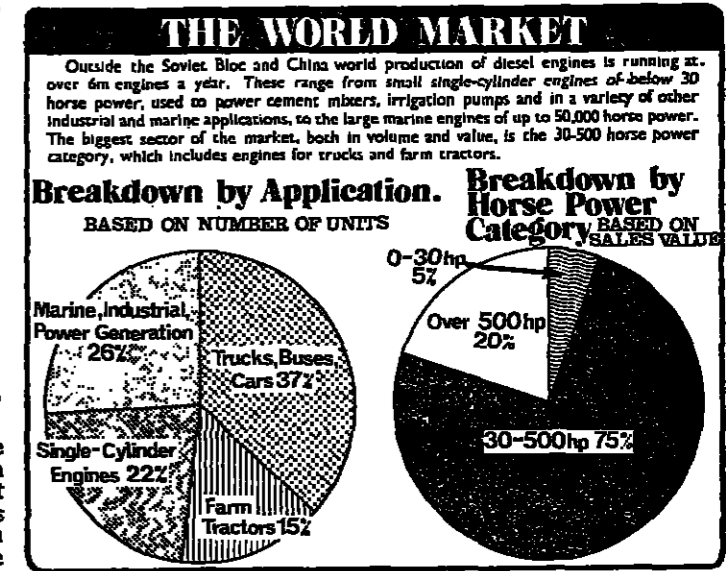
Report

A research report published last year by Lehman Brothers Kuhn Loeb, one of the leading New York investment bankers, predicted that domestic unit sales of diesel engines would grow at a 12-15 per cent annual rate over the next decade, compared to a 4-7 per cent annual rate during the preceding decade. "Incremental unit growth," said the report "will come in the automotive and light and medium duty truck markets as engine substitution (gas to diesel) accelerates due to increased public awareness of the diesel's efficiency, higher fuel prices and government encouragement of diesel development through liberalised emission standards and fuel efficiency regulations."

It is still unclear just how

favourable to the diesel engine U.S. regulations will be; in particular, there are fears that if the Federal Government sticks to its proposed standard on nitrous oxide emissions, some manufacturers of diesel-powered cars will be faced with almost insuperable technical problems. Even if the standard is relaxed, some European observers believe that for many potential customers the balance of advantage between diesel and gasoline will not be clear cut (especially if the efficiency of the gasoline engine is improved) and that the swing to diesel will not be as dramatic as the forecasts quoted above suggest.

Nevertheless, even a modest acceleration in the growth rate should provide plenty of opportunities for European and Japanese engine manufacturers, since in the lower hp ranges they have bigger volumes, more experience and greater technical know-how than the domestic U.S. manufacturers. Several of the leading foreign companies are



taking steps to strengthen their position in the U.S., either by take-overs or by setting up their own factories or by making supply arrangements with American original equipment manufacturers (OEMs).

An interesting competitive battle is taking shape, with European manufacturers of lighter diesel engines attacking the U.S. market and the big American manufacturers of the higher hp automotive engines, like Cummins, Detroit Diesel Allison (the General Motors subsidiary) and Caterpillar, seeking a larger share of the European market. Yet the strongest competitors in several segments of the market may prove to be the Japanese, who have used their huge domestic

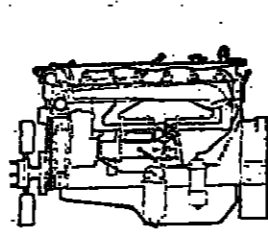
volume to build a strong position in the developing countries and increasingly in the U.S. Europe is the home of the diesel engine and much of the know-how on which other nations have built up their industries, including Japan and developing countries such as India, has been obtained from European manufacturers. In large marine diesels, for instance, Japan, with its immensely successful shipbuilding industry, has been almost wholly dependent on European licences. But Europe's traditional leadership in some of the fastest-growing parts of the market is under challenge. In the next few years the ability to sell will count at least as much as the ability to design and to manufacture.

Variations on a

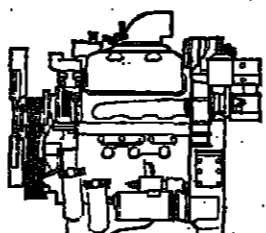


Bedford TM: one name that covers a range of eight tractor units. Each one is designed with the gross weight, payload capacity, power train and cab appropriate for specific kinds of operation.

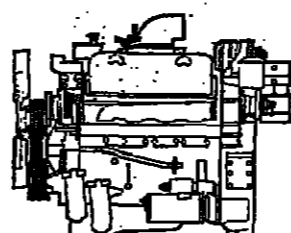
So, at one end of the scale, there's the TM 2300, ideal for low-cost short-haul work. At the other, there's the powerful TM 4200, the autobahn shrinker. It can



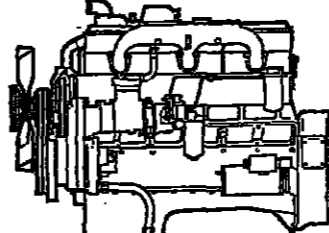
Bedford 500 in TM 2300 and TM 2500 (151 bhp).



Detroit Diesel 6V-71 in TM 3250 (222 bhp).



Detroit Diesel 8V-71 in TM 3800s and TM 4200s (297 bhp).



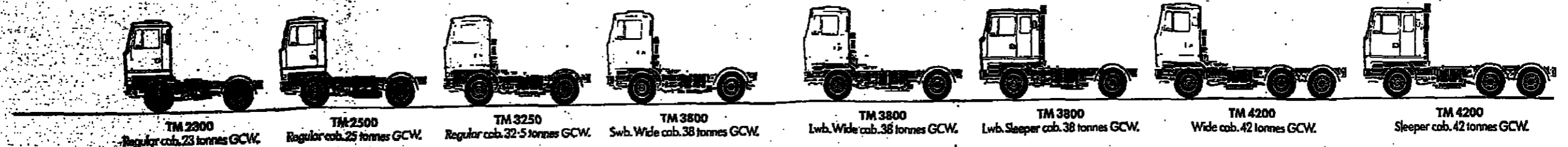
Cummins E290 now available as an option in TM 3800 (273 bhp).

cover immense distances at speed. Each TM tractor is an integrated piece of design. Engine is matched to chassis. Gearbox to

engine. Axle to gearbox. This means that each TM gives you optimum performance in terms of both power and cost efficiency.

All TMs are covered by Roadcall - it's the Bedford round-the-clock breakdown recovery service. The chances are you'll never need it, but just in case...

You see them here, the eight variations on the TM tractor theme. All you have to do is to choose the one that's right for your operation. And with the TM range, that's easy.



TM 2300 Regular cab, 23 tonnes GCW. TM 2500 Regular cab, 25 tonnes GCW. TM 3250 Regular cab, 32.5 tonnes GCW. TM 3800 Swb, Wide cab, 38 tonnes GCW. TM 3800 Lwb, Wide cab, 38 tonnes GCW. TM 3800 Lwb, Sleeper cab, 38 tonnes GCW. TM 4200 Wide cab, 42 tonnes GCW. TM 4200 Sleeper cab, 42 tonnes GCW.

BEDFORD TM



DIESEL ENGINES II

New trends in a complex industry

BECAUSE IT covers such a broad horse power range, from three hp to 50,000 hp, and such a variety of applications, the structure of the diesel engine industry is complex and difficult to define. It is possible to classify the main segments by engine speed (Table I) or by horse power (Table II), but the boundaries between the segments are not clear-cut. A medium-speed engine which belongs in the second category of Table I may compete in certain applications against a high-speed engine from the third category.

A further complication is that a company may have two entirely different ranges of engines within its portfolio. Thus Yanmar of Japan is probably the world's largest producer of small diesels for agricultural and other applications, but it also makes much larger engines of a different design for marine propulsion. Similarly MAN of Germany makes high-speed engines for trucks, but is also one of the major producers of very large slow-speed engines for marine propulsion. Within Hawker Siddeley there is not much in common between the small engines made by Pelter and Lister and the larger units made by Mirreles Blackstone.

At the top end of the horsepower category there are the three leading European producers of slow-speed marine diesels. Sulzer of Switzerland, MAN of Germany and Burmeister and Wain of Denmark. These engines were primarily designed for ship propulsion, but with the slump in

the world shipbuilding industry the manufacturers have been making strenuous efforts to find new markets, primarily stationary engines for power generation. The same is true of the medium-speed engines where Pielstick, MAN and a handful of other European manufacturers tend to dominate the world market, either through their own production or that of their licensees. Sulzer has 23 licensees in 16 countries making its slow-speed engines and 10 licensees in eight countries making its medium-speed engines.

It is interesting that even Japan, despite its prowess in shipbuilding, has relied mainly on European know-how for its medium-speed and slow-speed marine engine production. Engines designed by Sulzer, MAN, Burmeister and Wain, Stork-Werkspoor of Holland, Pielstick of France, MAK of Germany and others are manufactured by a number of Japanese companies including IHI, Mitsubishi and Hitachi.

These medium- and slow-speed engines are produced in small volumes—few companies have an output of more than 100 engines a year—and a major uncertainty over the next few years is whether there will be enough orders to keep all the manufacturers, both licensors and licensees, in business. Will the companies now operating succeed in obtaining enough non-marine orders to keep going until the shipbuilding market revives, perhaps in the mid-1980s or possibly later?

Much will depend on each company's ability to go on up-

dating and improving its engine designs—a process of evolution rather than revolution, but still requiring substantial expenditure; a particular area of attention at present is the need to improve the large engine's ability to burn low-quality fuel oils. The manufacturers must be able to generate enough funds to support their development programmes and this in turn depends on maintaining an adequate flow of new orders. Since the marine engine industry is likely to suffer from over-capacity for several years to come, some observers believe that the number of competing manufacturers and competing designs is certain to diminish. Whether this will come about through mergers between companies or through withdrawals from the diesel engine business remains to be seen.

Threat

A further threat to the medium-speed engine producers is the move by the high-speed engine manufacturers into the higher hp ranges. It is possible that in certain applications a high-speed engine made by, say, Caterpillar—a company which has the cost advantage of a large internal market for its engines—will compete against a medium-speed diesel produced in much smaller quantities. There are, of course, great differences between the two engines in design and specifications: quite apart from the conservatism of diesel engine buyers and their reluctance to abandon a proven supplier, there may be compelling technical reasons for ordering a premium-quality engine from a specialist supplier. Nevertheless, the tendency for the high-volume engine manufacturers to look for customers outside their traditional fields is certain to grow.

Below 500 hp, as Table II shows, there are also a large number of manufacturers, especially in Europe. A distinction can be drawn—although, as usual in this industry, it is a blurred one—between specialist engine manufacturers who supply to original equipment manufacturers (OEMs) and equipment manufacturers who make engines both for use in their own machinery and for outside sale.

The largest of the "pure" engine suppliers is Cummins Engine of the U.S. This company has in the past considered the possibility of an association with a truck manufacturer (who would provide the base load of orders), but has decided to stick to its role as an independent supplier: it is the major producer of diesel engines for heavy trucks in the

U.S. and has a large manufacturing investment in the UK. Another engine specialist is L. Gardner of the UK, now part of the Hawker Siddeley group. It produces engines for trucks and other applications in relatively small volume (about 5,000-6,000 engines a year), but its products have an enviable reputation for quality and durability.

In practice, however, a company like Perkins, though owned by Massey-Ferguson and deriving a substantial volume of business from Massey-Ferguson tractors and other equipment, regards itself primarily as an independent engine supplier: it can and does supply engines to the parent company's direct competitors. The same applies to Deutz in Germany; the parent company, Kloeckner-Humboldt-Deutz, makes tractors and farm machinery which use Deutz engines, but the engine side is managed as an independent business.

Some manufacturers of trucks, tractors and construction equipment have developed their outside diesel engine sales as a substantial business in its own right. In the U.S. General Motors has its Detroit Diesel Allison subsidiary which supplies engines to GM's competitors as well as to GM itself. Caterpillar, the world's largest producer of earthmoving equipment, has in recent years been investing heavily in new diesel engine facilities to supply outside customers. Ford is its largest OEM customer in the U.S. and it is seeking to establish a stronger hold on the European market. John Deere, the largest U.S. producer of farm tractors, is also putting a great deal of effort behind its non-captive engine sales.

In the UK the largest producer of diesel engines after Perkins is Ford. It has a big captive market in its own vans and trucks, but is also a major supplier to outside customers, including makers of construction equipment, generating sets and a variety of other products. Yet in its heaviest European-built trucks, for trans-continental operations, it relies on outside suppliers, principally Cummins. This illustrates the well-established pattern of inter-trading between diesel-engine manufacturers/users. BL, for example (formerly British Leyland) has one of the broadest range of diesel engines of any vehicle manufacturer, and has an important non-captive business, but it also offers engines made by Perkins and other suppliers in some of its own vehicles.

Inevitably a look at the 30-500 hp category in Table II

prompts the question whether the market can accommodate all the suppliers now operating. Most people in the industry believe that despite the expected growth in demand for diesel engines there will be a tendency for the number of independent engine manufacturers to diminish.

Traditionally, most of the European heavy truck manufacturers have made their own engines. Some of them, of course, do so on a very large scale; their internal demand gives them a solid base on which to develop their outside engine sales. Daimler-Benz clearly falls into this category, as does Fiat. But as the trend towards larger engines continues and as the necessary effort in design and development becomes more costly (both to improve engine performance and to meet noise and other regulations), it is possible that some of the smaller truck manufacturers may decide to increase their purchases from outside engine suppliers.

Companies like Cummins argue that they have the volume to support the investment in new engine development and that the truck manufacturers, unless they are operating on a very large scale, cannot afford to duplicate it. For a truck manufacturer to withdraw totally from engine production is a difficult decision, with social and employment implications—quite apart from the blow to prestige. But it seems likely that the smaller truck makers, as they prepare for investment in a major new model programme, will tend to increase their reliance on outside engine suppliers.

Caution

Forecasts of rapid and far-reaching rationalisation in the diesel engine industry need to be treated with caution. Operators of trucks, construction equipment, fishing boats or even power stations, once they become convinced that a particular engine is totally reliable and suits their requirements satisfactorily, are extremely reluctant to switch to another supplier. (By the same token, if an engine breaks down in service, the supplier will find it virtually impossible to re-establish his reputation with that particular set of customers.)

Hence a company which produces high quality engines and enjoys the confidence of his customers can maintain a successful and profitable business even though his volume of output may be small. Engineering a new engine into a truck and proving it in service may take four years or more and at the end of it the new engine may be offered only as an option, not as the standard. Market shares in this industry do not change as rapidly as they do in some consumer products.

At the bottom end of the hp range the competition is no less fierce, with the Japanese moving strongly ahead in recent years. Japan probably accounts for not far short of half of all diesel engines produced in the 0-30 hp range. The biggest manufacturers are Yanmar and Kubota,

TABLE II STRUCTURE OF THE INDUSTRY

The table lists some of the main European, Japanese and American manufacturers in each category. Manufacturers who are primarily licensees are not included.

Size and main applications	WESTERN EUROPE				JAPAN	U.S.
	ITALY	FRANCE	GERMANY	UK		
0-30hp Pumps, small generators, small agricultural and industrial equipment, marine	Lombardini Ruggerini Ducati Man Pelters ¹ Lister ²	Bernard Hatz Farymann Deutz ³			Yanmar Kubota Mitsubishi Isuzu IHI	Onan ⁴ Teledyne Wisconsin
30-500hp Trucks, buses, cars, tractors, farm machinery, construction equipment, power generation, ship propulsion	Daimler-Benz Volkswagen Deutz ³ Man BMW ¹³ Opel ⁴ UK Perkins ⁷ Ford Leyland Cummins Gardner ⁵ Rolls-Royce Motors Bedford ⁶ Lister ¹ Kelvin ⁸ Dorman ⁹	Pengoot/Citroen Renault Baudouin ⁵ IT Fiat VM Same SWEDEN Volvo Saab-Scania HOLLAND Daf			Isuzu Mitsubishi Toyota Nissan Toyo Kogyo Daihatsu Komatsu IHI Yanmar	Detroit Diesel ¹⁴ Cummins John Deere Int. Harvester Mack Waukesha ¹⁰ Teledyne Continental Allis-Chalmers Perkins ⁷
500-5,000hp Ship propulsion, power generation, rail traction, other industrial uses	GERMANY MTU MWM ¹³ MAK ¹⁴ Deutz ³ UK Ruston ⁵ Paxman ⁵ Mirreles Blackstone ¹ APE-Allen ⁶ Cummins Rolls-Royce Motors SWITZERLAND Sulzer	SEMT-Pielstick ⁸ ITALY Grandi Motori Tiriste SWEDEN Nohab ¹⁰ NORWAY Bergen FINLAND Wartsila HOLLAND Stork-Werkspoor Brons			Daihatsu Nigata Fuji Yanmar IHI Alaska Mitsubishi Hanshin	Electro-Motive Division of GM ⁴ Cummins Caterpillar Alec ¹¹ Delaval Fairbanks Morse ¹¹ General Electric Cooper
Over 5,000hp Ship propulsion, power generation	SWITZERLAND Sulzer DENMARK Burmeister and Wain GERMANY MAN MAK ¹⁴ Deutz ³ FRANCE SEMT-Pielstick ⁸ BELGIUM ABC	UK Dorford ¹² Mirreles Blackstone ¹ HOLLAND Stork-Werkspoor ITALY Grandi Motori Tiriste HOLLAND Stork-Werkspoor ABC			Mitsubishi Mitsui	Delaval Fairbanks Morse ¹¹

Notes:
 1 Hawker Siddeley
 2 37 per cent owned by Hawker Siddeley
 3 Kloeckner-Humboldt-Deutz
 4 General Motors
 5 GEC
 6 Dresser Industries
 7 Massey-Ferguson
 8 Amalgamated Power Engineering
 9 Alsthom-Atlantique
 10 Bofors
 11 Colt Industries
 12 British Shipbuilders
 13 Knorr-Bremse KG
 14 Fried. Krupp GmbH

Engine categories

THERE ARE three main categories of diesel engines:

- 1—Engines with a speed up to 250 revolutions per minute (rpm), weighing 20kg (44lb) per horse power or more. These consist of low-speed two-stroke crosshead engines with piston diameter of about 1 metre (3.28 ft). They are produced in versions ranging from four to 12 cylinders and cover an output span of about 6,000 hp to 48,000 hp.
- 2—Engines with a speed of 350-1,000 rpm, weighing between 5 and 15 kg (11-33 lb) per hp. There is a range from 2,000 to 30,000 hp in engines of 6-18 cylinders. They are used in ships where a lot of power has to be accommodated in tight space, such as ferries, passenger ships and high-speed freighters.

Specialised ships concerned with offshore exploration also use this type of engine, but because of the depressed state of the shipbuilding industry about half the industry's output is at present going into stationary applications, for power generation.

3—Engines with a speed range of over 1,000 rpm and weighing 2-5 kg/hp (4.4-11 lb/hp). This is the big volume sector of the industry, with an annual output of around 5m units, compared with a few thousand in the first and second categories. Trucks, tractors and construction equipment are among the main applications, but engines of this type are also used to power small boats, in electricity generation, in irrigation and in a great variety of other industrial applications.

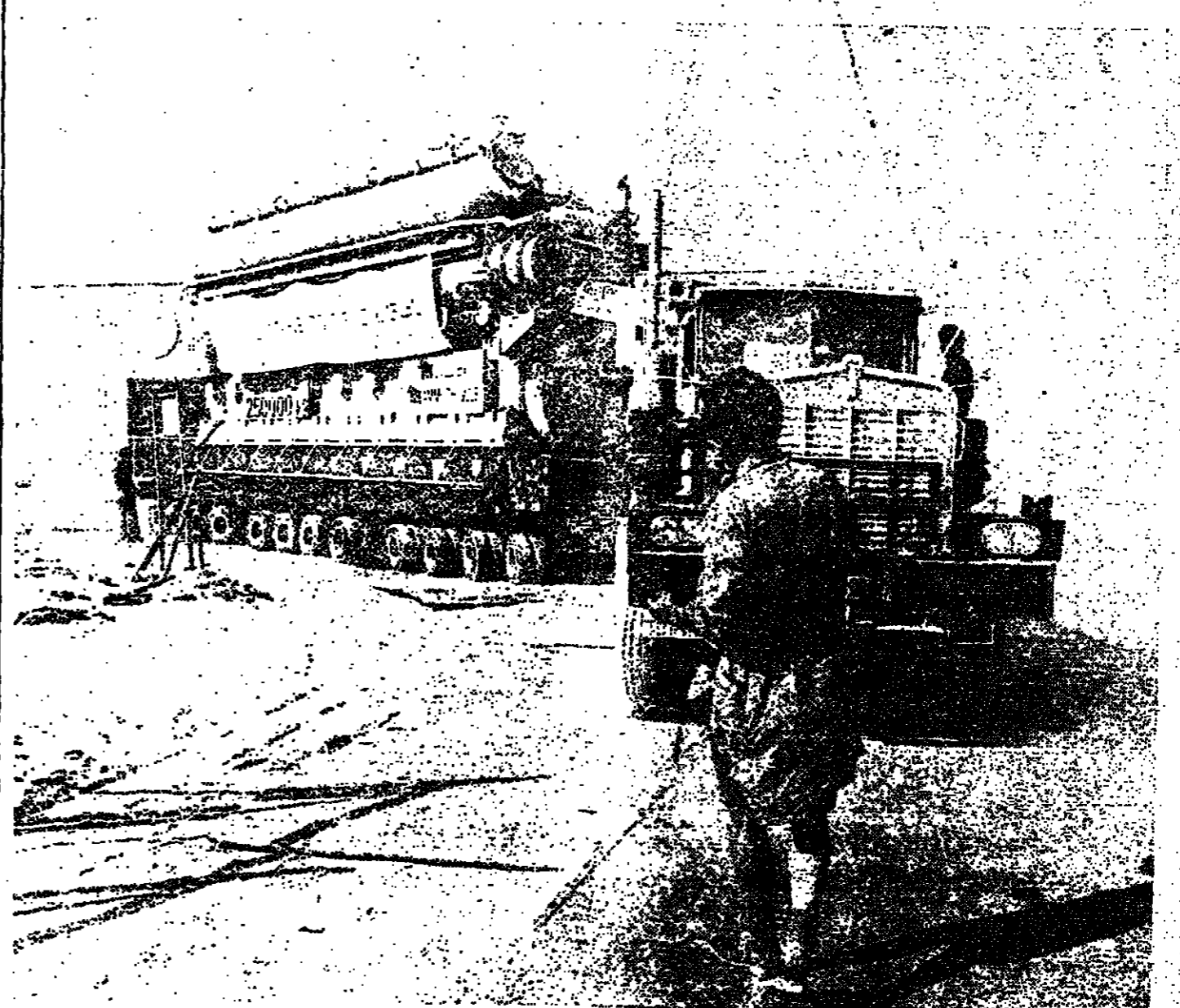
Source: Robert Bosch.

both of whom have a substantial in-house requirement for engines used in small tractors and construction equipment. Many of these engines are not suitable for sale to OEMs in Europe and the U.S., where the requirement is for a more rugged engine, but they have a big sale in the developing countries, especially in the Far East where agricultural conditions are similar to those of Japan.


Other strong contenders in this hp range include the Italians, Lombardini and Ruggerini, and Kirloskar of India, as well as the established British and German producers.

Throughout all the segments of the industry competition is becoming increasingly international. As in other branches of engineering, there may be a tendency for the industry to polarise, serving a limited market, and the large-scale producers who see the need to compete strongly in all the main consuming markets, often with their own manufacturing facilities; at the same time the barriers between the different sectors of the industry are likely to become even more blurred. The choice of strategy for the diesel engine manufacturer, in relation to design, manufacture and marketing, is likely to become even more difficult in the future.

By Geoffrey Owen



Stork Werkspoor Diesel of Holland built its first marine diesel engine in 1908 and is one of the leading producers of medium-speed engines for marine and industrial applications; the range consists of the TM410 and the TM620 with outputs from 4,000 to 22,000 bhp per engine. The company also produces a range of smaller engines with outputs ranging from 500 to 1,800 bhp per engine. Like other medium-speed engine builders, Stork Werkspoor has been seeking to develop new markets in power generation. A total of 12 TM620 engines, six in each of two power stations, are currently in operation. One of these is in Saudi Arabia and the other in the Emirate of Ras-Al-Khaimah. The picture shows the first TM620 diesel engine being transported to the Ras-Al-Khaimah power station. The first V-form TM620, a 12-cylinder engine, is now being assembled in the Amsterdam factory; the company believes there is "interesting potential" for this engine in 100-200MW power stations.



WHO SAID OUR NEW GOLF ENGINE WOULD NEVER GET OFF THE GROUND?

Far from just getting off the ground, the new Golf 1500cc. diesel engine is a roaring success. In fact, it's proved to be the most modern, efficient, economical and quiet engine of its type. (As quiet as the petrol version you'll find in the equally successful Volkswagen Golf saloon.)

And like all Volkswagen's industrial diesel engines, its uses are wide ranging. You'll get the same superlative performance whether it's planted firmly on the ground in compressors and generators or flying high in an air ship.

The full range of water and air-cooled engines is available in the UK exclusively from MIAC.

Find out more about the current range of engines by posting the coupon. (And keep a look-out for the new six cylinder diesel engine, available soon.)

Please send me your technical brochure about Volkswagen industrial engines.

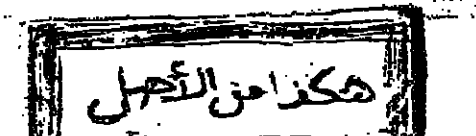
Name _____ Position _____

Company _____

Address _____

Tel No _____

miac MIAC, Yeoman Drive, Balfour, Midlothian, Edinburgh, EH14 5AN. Telephone: 01843 65111



THE FINAL DIESEL FACT:

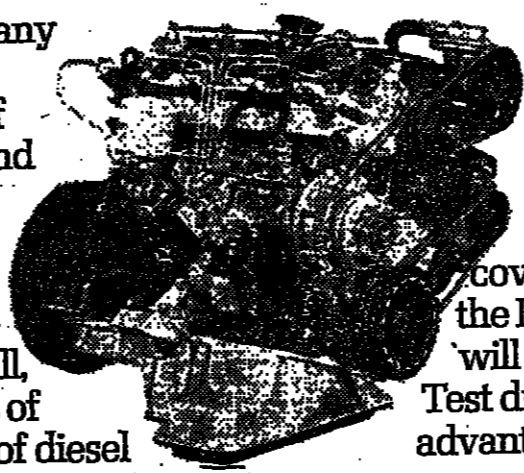
More people choose Peugeot than any other.

The figures speak for themselves. When purchasing a diesel powered car more people choose Peugeot than any other. Fact!

Why is this? Firstly, we offer a comprehensive range of Saloons and Estates. Cars that are suitable for family and business motoring needs.

Secondly, Peugeot are the diesel experts, having built well over a million diesel engines, each one to highly exacting standards.

A Peugeot diesel engine is strong, reliable and, above all, very economical. Peugeot have combined the benefits of diesel to the qualities of the luxury car. The 504 range of diesel



cars is quiet, comfortable and so easy to drive, making them superb for the high mileage motorist who wishes to cover long distances economically and in total comfort.

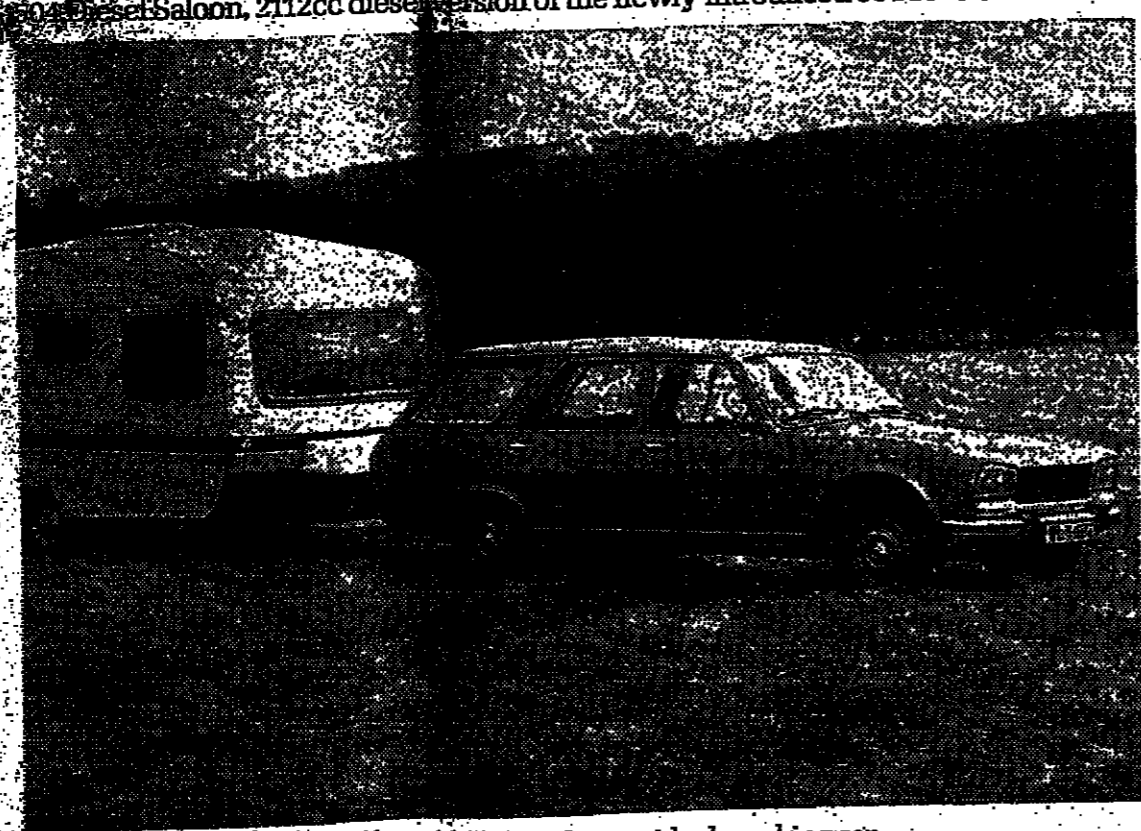
There's Peugeot Finance with extended credit or leasing facilities* to make owning a 504 Diesel so easy. A twelve month unlimited mileage guarantee covers every car and with over 230 dealers throughout the British Isles, you have the reassurance that servicing will present you with no problems. Test drive a 504 Diesel and discover for yourself the many advantages of Peugeot Diesel motoring.



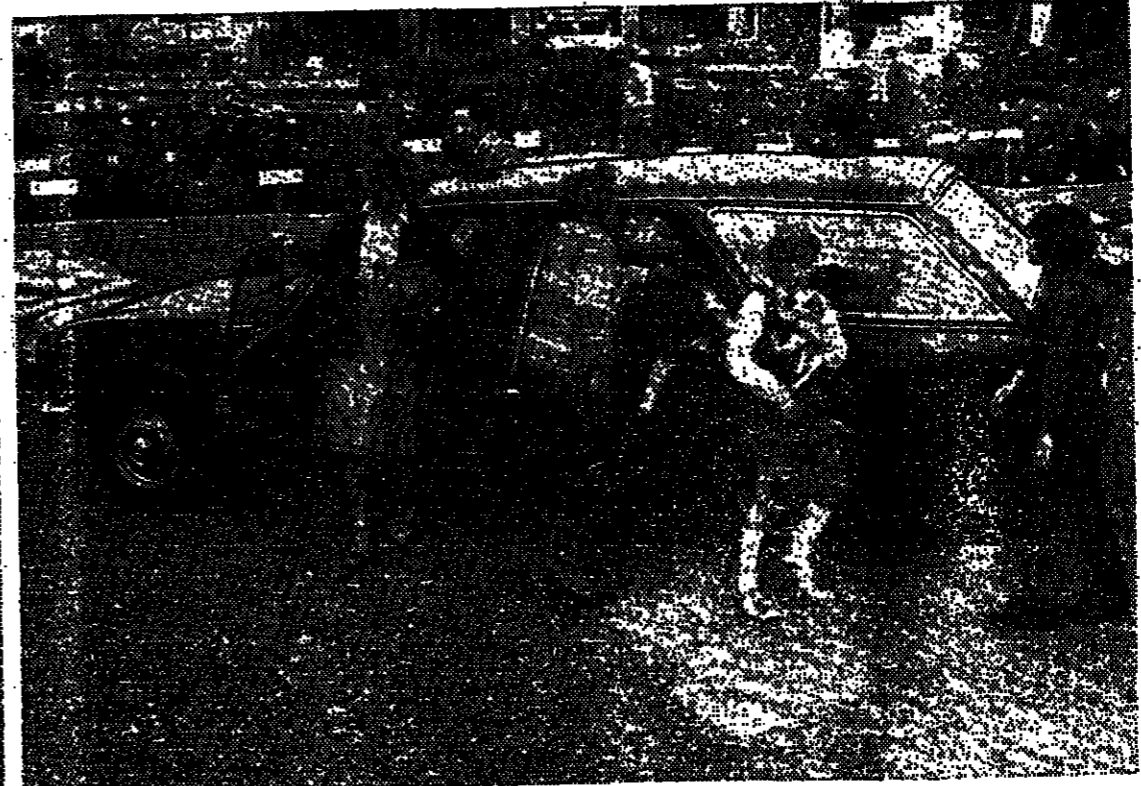
504 Diesel Saloon, 2112cc diesel version of the newly-introduced 504 1800 Saloon.



504 GLD, a truly luxurious car powered by a 2304cc engine.



504 Diesel Estate with a 2112cc engine makes an ideal working car.



504 Family Estate Diesel, 2304cc with three rows of forward-facing seats for carrying up to eight people.

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Peugeot Automobiles U.K. Ltd., 333 Western Avenue, London W3 0RS. Tel: 01-993 2331.

*Finance and leasing facilities available through Peugeot Finance, subject to acceptance.



DIESEL ENGINES IV

While the builders of large marine engines are suffering from the world slump in shipbuilding, there are hopes of spectacular growth in the demand for diesel-powered cars. On this, and the following two pages, the prospects for the diesel engine in automotive and marine applications are assessed.

A boom in car sector is forecast

THE PASSENGER car diesel engine sector is the cause of most current excitement. Authoritative forecasts are for Western world demand to increase at an average of nearly 25 per cent a year—admittedly from a fairly low base—up to 1985.

The car diesel boom will be powered by the major changes taking place in the U.S. market and the commitment of America's biggest manufacturer General Motors to a dieselisation policy for up to one-third of the 5.5 million cars it produces every year.

But for different reasons the European makers will not be far behind in creating public awareness and demand for diesel-powered cars. Two years ago only four diesel cars were available in Europe. Now every major European manufacturer has introduced, or is working hard to introduce, a diesel car and if demand continues at the current levels the 1977 output

in Europe of 482,500 diesel cars will double by 1985. It can be argued that about 10 per cent of those who buy new cars do the kind of mileage or motoring which would make the purchase of a diesel car a viable proposition. So in theory sales could go on growing rapidly until this level of market penetration by the diesel is reached. There is another factor, however. If diesel cars became "fashionable" in some way that would give demand a further big boost.

There are already signs of this "pull" in demand from the motorists in West Germany, where diesel cars account for about 5 per cent of the market with 1977 sales of 121,300.

Already half of Mercedes' car output is diesel-powered and both General Motors, via its Opel subsidiary, and Ford have entered the market—Ford perhaps a little reluctantly by offering an older version of the French-made Peugeot diesel engine in a Granada.

Latest of the German entrants has been Volkswagen with a diesel version of the Golf. This has been embarrassingly successful and VW just cannot keep up with demand at present. One in four orders for a new Golf in West Germany is for the diesel-engined version but sales are not at that level because many customers are not willing to wait two years for delivery.

In France long-established diesel car maker Peugeot has been joined by Citroen with a version of its CX saloon, a development which was on the way even before the two merged. The latest recruit to the Peugeot fold, Chrysler Europe, makes a diesel car in Spain.

It is France which leads the way in Europe with diesel cars because they account for about 6.5 per cent of the total new car market. Some 122,300 diesel cars were sold there in 1977.

This seems to be because the cost of both types of fuel—petrol and DERV—are relatively high

and because in French companies cars are not handed out as "perks" to salesmen. Salesmen are paid a basic sum towards their travelling expenses and are expected to provide both the car and the fuel to power it from that amount.

This points us immediately to the underlying reason for the worldwide surge of interest in the diesel car—diesel engines offer much better fuel economy than equivalent petrol engines. Opinion varies on how much, but even the most conservative engineers agree on at least 25 per cent overall improvement in fuel consumption.

The diesel shows its greatest efficiency advantage under part-load conditions, meaning that stop-start urban motoring with a diesel car returns consumption figures up to 50 per cent better than an equivalent petrol-engined car.

For the petrol engine is a highly inefficient power unit. At full-load (in a speed, high mileage motoring) it yields about 33

per cent of its potential energy, with the remainder lost in the cooling water, exhaust and internal friction. At part-load (urban, stop-start motoring) the efficiency is about 8 per cent.

Official tests in the U.S. showed that the VW Golf, known there as the Rabbit, when powered by a 1.5 litre petrol engine in urban conditions averaged 25 miles per U.S. gallon. With a 1.8 litre diesel engine the Rabbit achieved 40 mpg—a 60 per cent improvement. In highway conditions the figures were 38 mpg, 53-mpg or a 39 per cent improvement.

At the heavier end of the market, the comparisons between automatic versions of the Mercedes 300E with a 2.8 litre petrol engine and a 300D with a 3 litre diesel were equally revealing.

There was a 57 per cent improvement between petrol and diesel in urban motoring (from 14 mpg to 22 mpg) and a 47 per cent benefit in highway conditions (from 19 mpg to 28 mpg).

Fuel economy has become a critical factor for car makers all over the world since the

quadrupling of the price of crude oil after the 1973 Middle East war. Some countries tried to hold down petrol consumption while at the same time limiting damage to industrial users by widening the difference in price between petrol and diesel oil. In Brazil, Italy, Japan, Mexico, Spain and Sweden diesel is less than half the price of petrol. Only in Brazil did the Government also introduce legislation which effectively makes diesel cars unobtainable—thus preventing private motorists from enjoying the benefit of cheaper fuel meant to stimulate industrial development.

It is no wonder then that the latest addition to the diesel cars on offer comes from Fiat of Italy where the price of DERV is less than one-third of that of petrol.

However, it is in countries where fuel prices are high that diesel cars make the most significant progress because the differential between the two

types of fuel need not be great before diesel shows savings through its superior fuel economy. Thus West Germany is among the major producers of diesel cars even though the prices of petrol and DERV are about the same.

In fact, there would be absolutely no contest between petrol and diesel cars but for the fact that diesel engines must cost more. They use complicated fuel injection equipment, need an uprated battery and starter motor, and may involve detail changes to a car's technical specification. All this has to be reflected in the price.

To make economic sense the breakeven point between the additional cost of the diesel engine and savings on fuel costs should take place while the first owner is still driving his diesel car. He has to recover the extra investment early enough to go on and gain the real benefit from lower running costs. It would not make sense for the UK motorist, for example, to pay an extra £500 for a diesel version of the car he wants, cover only 10,000 miles a year at today's fuel prices and then sell the car after two years.

But the manufacturers themselves can either hold back or stimulate demand for diesel engines by their marketing policies. The add-on cost for various diesel cars is far from consistent throughout the world. Who can blame VW, for example, for adding 15 per cent to the price of the diesel Golf, where it has no hope of matching demand? In Britain Peugeot adds 15 per cent to the normal cost for a diesel version of the 504GL but in France the differential is 20 per cent.

In future the real extra cost of diesel engines will continue to fall because economies of scale can be achieved if the diesel cars can run along the same assembly lines as the petrol versions. This already happens with VW in West Germany and Oldsmobile in the States.

This introduces another important factor about diesel engines for cars. Many people in the motor industry believe that such diesels will be derived almost universally from diesel petrol engines. The cylinder head is the only major special component in a diesel engine and if a manufacturer can use almost the same basic components for both petrol and diesel units he has the flexibility of manoeuvre essential for volume production. He gets economies of scale in production of the engine and car assembly.

More important, perhaps, nobody yet is willing to guess how far dieselisation of cars will go. Will it fade fast in a few years? Will there be a boom beyond the most optimistic expectations? Either way a volume producer using the same basic power unit, either petrol or diesel, will not be caught wrong footed.

The major drawback to this approach is that it gives engines performance characteristics which will make them suitable only for car, light commercial and marine applications—but that is not much of a penalty as far as the big motor makers are concerned.

One of the most significant recent events in this connection was when Perkins, still the largest builder of diesel engines in the world, stopped an £8m investment programme aimed at developing a small diesel for cars and light vans. The group took this action after the diesel Golf appeared successfully using a dieselised version of a petrol engine.

Even BL, which through Leyland Vehicles has a long history of diesel engine expertise (the Daf, Scania, Volvo, Mack and Pegaso diesels can all trace their origins back to Leyland designs) is preparing a dieselised version of the B series petrol engine to take it into the diesel car market and will offer a 1.8 litre diesel Princess by the middle of 1979.

In the longer-term dieselised O series engines and others will be used to power BL vehicles. Chrysler in Spain has had some success with 160 and 180 cars equipped with diesel engines from its Barretros truck subsidiary but is working to convert existing petrol engines to diesel operation.

The odd manufacturer out in Europe at the moment is Fiat. The Fiat 131 and 132 cars are or soon will be—available with a diesel engine produced by a new company, Sofim, set up in 1974 by Fiat, Alfa Romeo (the State-owned Italian concern) and Renault (the State-owned French group).

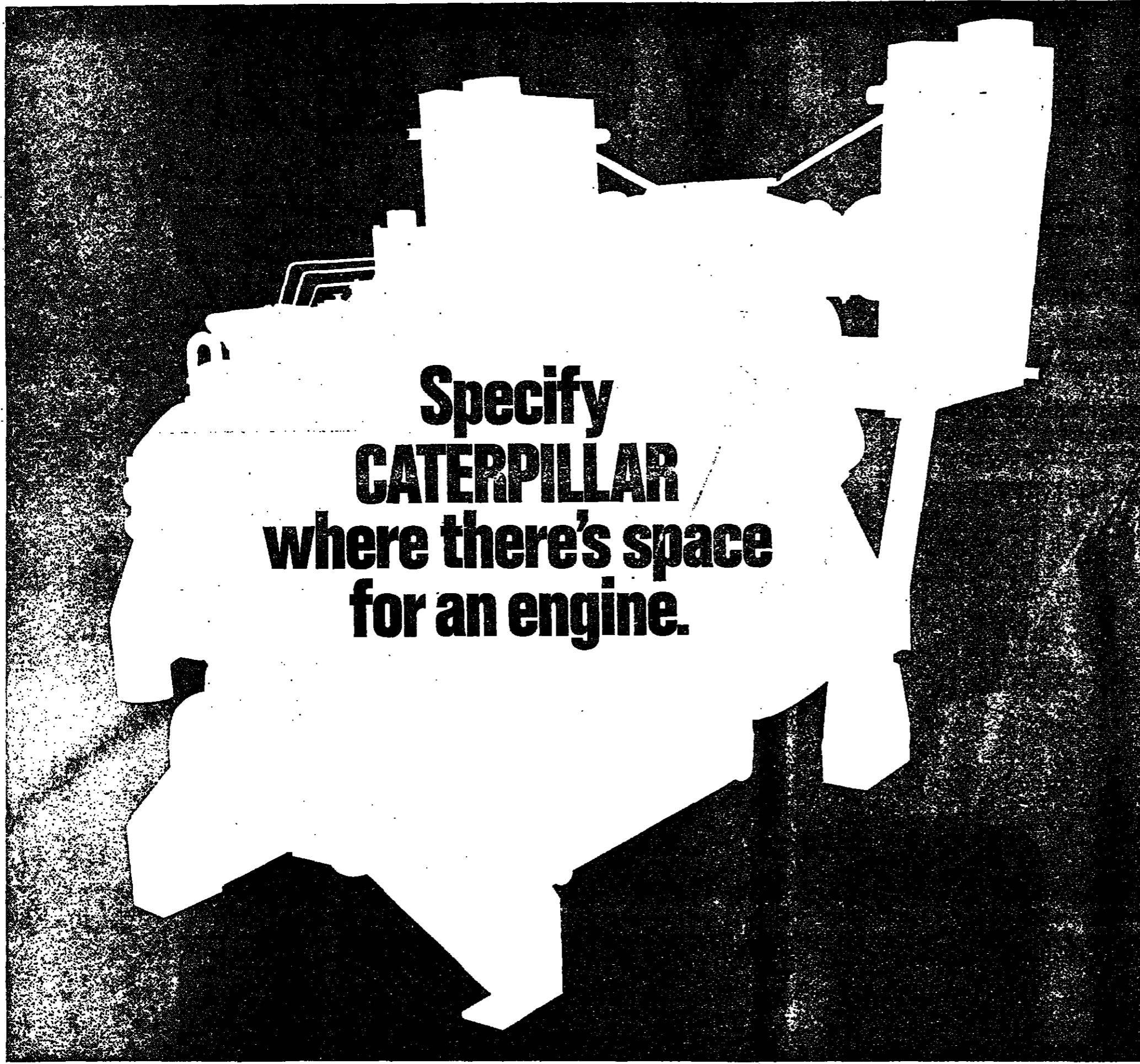
At Foglia in the south of Italy, the Sofim plant is making a small diesel engine for car, commercial vehicle and industrial uses. So they are by no means lightweight. The 2.5 litre Sofim diesel in the 131 weighs 170 lb more than the usual power unit, a 1.6 litre petrol engine. Fiat have put a bulge in the budget so that it will clear the tax diesel engine.

The Sofim plant needs to reach an output of 1,000 engines a day to become profitable. But diesel versions of the new Fiat Ritmo are likely to appear in 1979 powered not by the Sofim unit but by a dieselised petrol engine based on the 132 model cylinder block. And in spite of its investment, Renault's diesel versions of the R20 and R30 will be using a dieselised version of the 2 litre petrol engine made at the jointly-owned Peugeot-Renault-Volvo plant at Douvrin in northern France.

When it launched the 131 diesel recently Fiat pointed out that sales of diesel cars in Europe have doubled since the oil crisis (they were 180,000 in 1974) and predicted they would increase at about 11 per cent a year for another four or five years.

General Motors' president E. M. Estes, has given his own prediction about the U.S. He said that at least 25 to 30 per

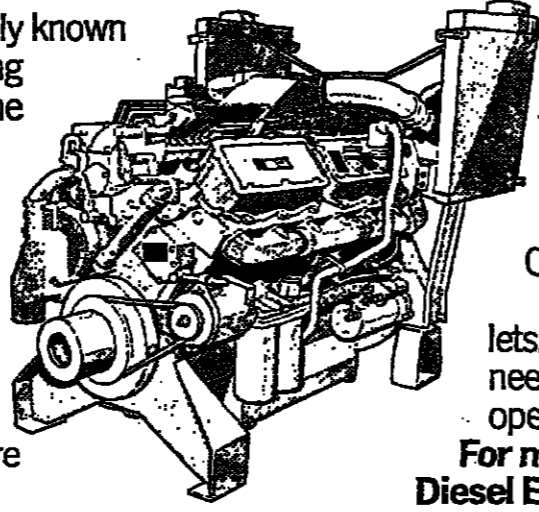
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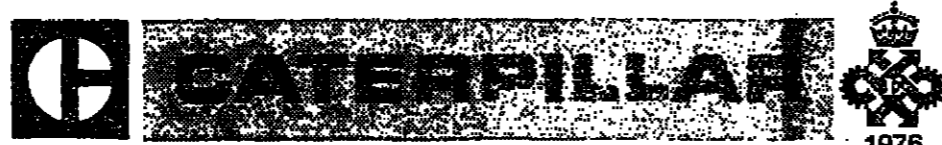


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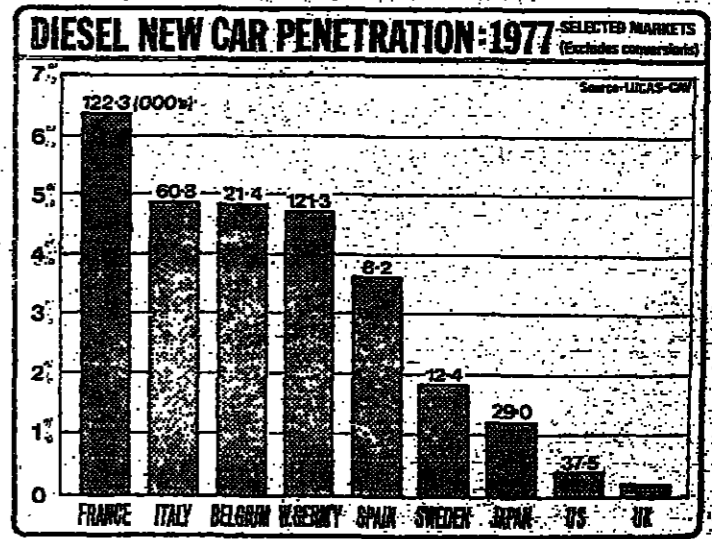
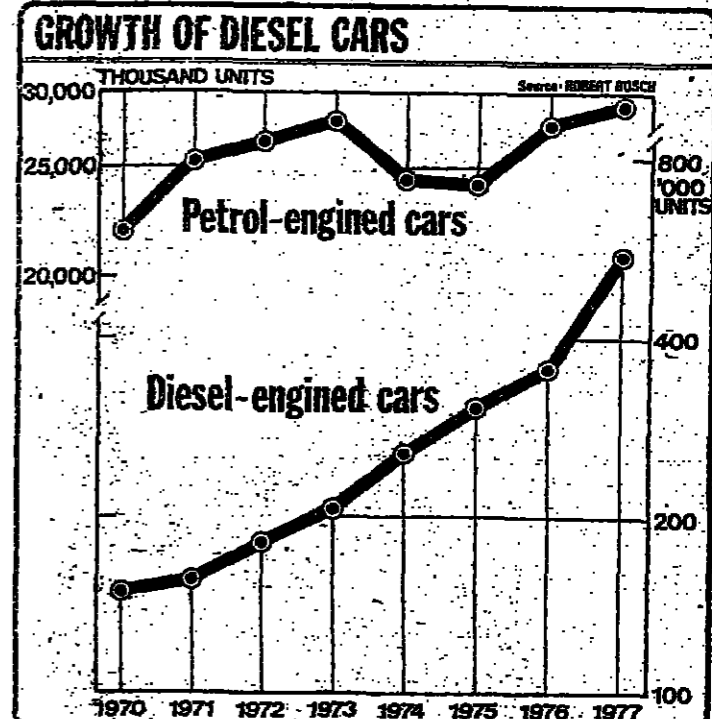
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هكذا من الأفضل

DIESEL ENGINES V

Truck makers use the major share

THE MOST extensive use of diesel engines is to power commercial vehicles. Commercial vehicle engines account for nearly half the diesel industry's total turnover. In 1978 some 1.58m diesel-engined commercial vehicles were built in the Western world and the engines themselves had a value of £2.4bn.

Authoritative forecasts suggest that demand for commercial vehicle diesels in the West will advance at around 3 per cent a year up to 1985 at which stage around 3.5m a year would be required. Because of the expected surge in passenger car diesel engines which are predicted to grow at around 25 per cent a year over the period the share of the total diesel market in volume terms held by commercial vehicle engines will remain constant at around 41 per cent.

In Europe, except for the UK, the tendency is for the truck makers to manufacture their own diesel engines. Fiat, Berliet (part of Renault), Daimler-Benz, MAN, Daf, Volvo and Scania, for example, all make their own diesel power units. The only notable exception in Continental Europe seems to be Saviem (now also part of Renault of France) which uses a MAN unit.

Also in Europe Ford, with 240,000 engines of the 30 to 600 hp type produced in 1976 (but with substantial sales to industrial customers and to its own tractor business), Fiat, 190,000, and Leyland Vehicles, 100,000, are among the major producers.

Dodge, the Chrysler offshoot, uses Perkins and Mercedes (Daimler-Benz) diesels at the heavy end of its range while General Motors Bedford truck-making subsidiary can offer Cummins as well as its own two-stroke Detroit Diesel.

There are other influences, too. For example, it came as no surprise to find that the latest in the range of trucks from Seddon Atkinson is powered by an International Harvester-made diesel rather than a Gardner like its predecessor.

But trends are only trends and there can be exceptions. The current exception to the general rule about the independents becoming less important in the truck engine business is Dorman, an offshoot of GEC of the UK, which is making strong attempts to break into the business and is selling to ERF.

Another trend for which there are few exceptions is the one which has seen hauliers asking for comparatively more horsepower under the bonnet. For example, not many trucks now stick at the UK legal minimum which is that there should be at least 61hp per ton.

Table with 2 columns: Diesel engine production in 30hp to 500hp range, Unitst. Rows include Perkins, Daimler-Benz, Ford, Isuzu, General Motors, Fiat, John Berre, Peugeot, Mitsubishi, International Harvester, KHD, Cummins, Leyland, Caterpillar.

Of course, at the heavy end of the truck business everywhere, including the States, diesel engines are almost universally used because fuel consumption is so great and many are the miles covered by the big trucks in a year.

But now diesellisation is growing fast in the mid-range vehicles in the U.S., what the Americans call the Class 6 trucks weighing between 9 tons and 11.8 tons. In 1977 only 8 per cent of the trucks sold in this category were diesel-powered, involving 11,000 out of some 138,000 units.

While these Europeans will be sending built-up trucks to the U.S., a different approach will be employed by M.A.N. of Germany (Maschinenfabrik-Ausbau-Nuremberg) which has acquired 12.8 per cent of White Trucks of America. Between them they will develop a new middle-weight diesel truck. M.A.N. hopes to be able to incorporate some European components in the new vehicles and believes that capital-intensive products such as the engines and axles it has developed as part of a joint venture with Volkswagen could be competitive in the U.S. as long as the dollar's value does not slip too far.

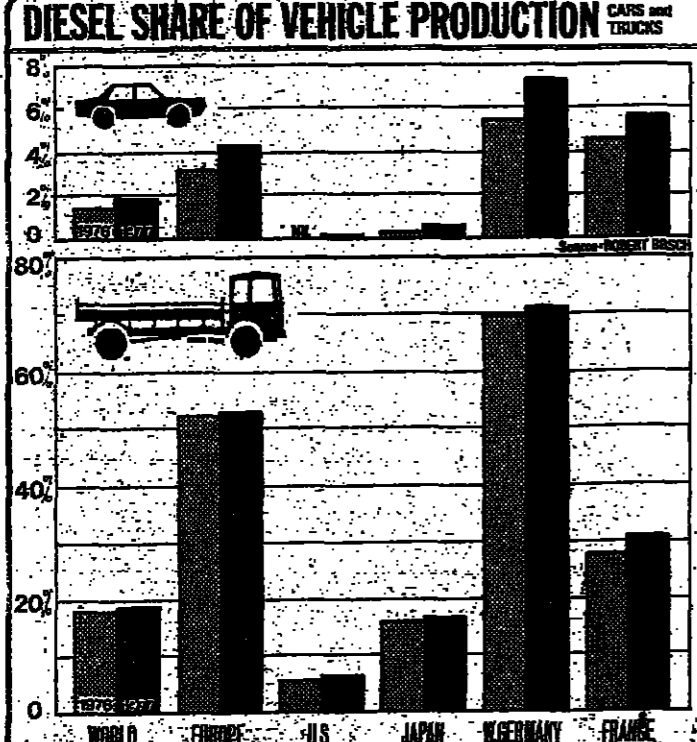
The indigenous American diesel engine producers will not let the new opportunities go unexploited. The major producers in the U.S. of Class 6 trucks, Ford, General Motors and International Harvester, are all taking steps to improve their position in diesel-powered vehicles.

And the engine manufacturers themselves, notably Cummins, Caterpillar, and Detroit Diesel Allison engine offshoot, are developing new products to meet the growing demand. They are, of course, major producers in Western world terms already. In 1976 Caterpillar produced 90,000 diesel engines in the 30 to 500 hp range, Cummins 120,000 and General Motors 191,000. The group recently sold its millionth Detroit Diesel.

Finally a word about what is almost certainly the most-ambitious diesel engine project in the world today. In the Soviet Union at Naberezhnye Chelny, near the geographical centre of the country, the Kama River project involves an amalgamation of seven plants which the Russians say will be capable of producing 150,000 trucks a year and also 220,000 diesel engines.

The current aim is for this scale of production to be reached by 1982. Daimler-Benz and Fiat technology has been used at the purpose-built plant which will be providing engines mainly for vehicles to be built in the Soviet Union and other Comecon countries.

Kenneth Gooding



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Kenneth Gooding

Car sector

CONTINUED FROM PREVIOUS PAGE

cent of his company's cars will be powered by diesel engines in 1985. GM must meet this target if it is to comply with the Corporate Average Fuel Economy (CAFE) requirements. American manufacturers have been told by Washington to push up average fuel consumption across their model ranges to 28.5 U.S. mpg by 1985 by gradual stages from today's average of 18 mpg.

GM feels that the diesel option is the best means available to help lift its CAFE while at the same time offering the customers a six-seater car. "And GM aims to preserve the six-passenger car," Mr. Estes exclaimed.

However, GM's main rival, Ford, is taking a different view. Basically, Ford believes that currently the disadvantages of the diesel engine outweigh the fuel economy advantages and it has been working on the theory that the petrol engine can be adequately improved so that the group can meet the CAFE requirements while keeping large cars in its range.

Large advertisement for Lucas CAV featuring a stylized '100' logo, a diesel engine image, and the headline 'The 80's could be a quiet time for diesel engine users'. Text includes: 'All over the world, diesel engine noise and pollution legislation is tougher than ever before...' and 'Working towards a quieter, cleaner world'.

DIESEL ENGINES VI

Key questions in the marine sector

TWO QUESTIONS dominate the marine diesel engine industry today: the short-term problem of the shipbuilding recession...

MERCHANT SHIP MAIN ENGINES COMPLETED IN 1977

Table with columns for designer/manufacturers, number of engines, brake hp, and market share. Includes entries for Fiat, MAN, Deutz, Sulzer, etc.

In the longer term. The main advantages in medium speed are lightness and compactness added to a higher degree of operational flexibility...

Agreement

There is general agreement that the fuel issue will dominate the thinking of shipowners and therefore engine designers for some years to come.

General Electric in America has also been working on the possibility of returning to coal as a marine fuel for steam turbines...

MERCHANT VESSELS ON ORDER

Table showing merchant vessels on order for October 1978, categorized by motorships and steamships, with columns for No., DWT, HP, and Total.

So far as the recession goes, all the engine builders have now had four years to plan for what are certain to be two to three very lean years indeed.

Innovation. Engine-builders have also, naturally, tended to concentrate their development ideas upon the range of engine sizes likely to be in greatest demand in the next few years...

reduction of operating costs for its low-speed engines of 12 per cent. In today's tight situation when protectionist attitudes in shipbuilding appear to be continuously hardening...

Unsurprisingly, the most vigorous proponent of the resurgence of steamships theme is the world's biggest marine steam turbine manufacturer, Stal-Laval of Sweden.

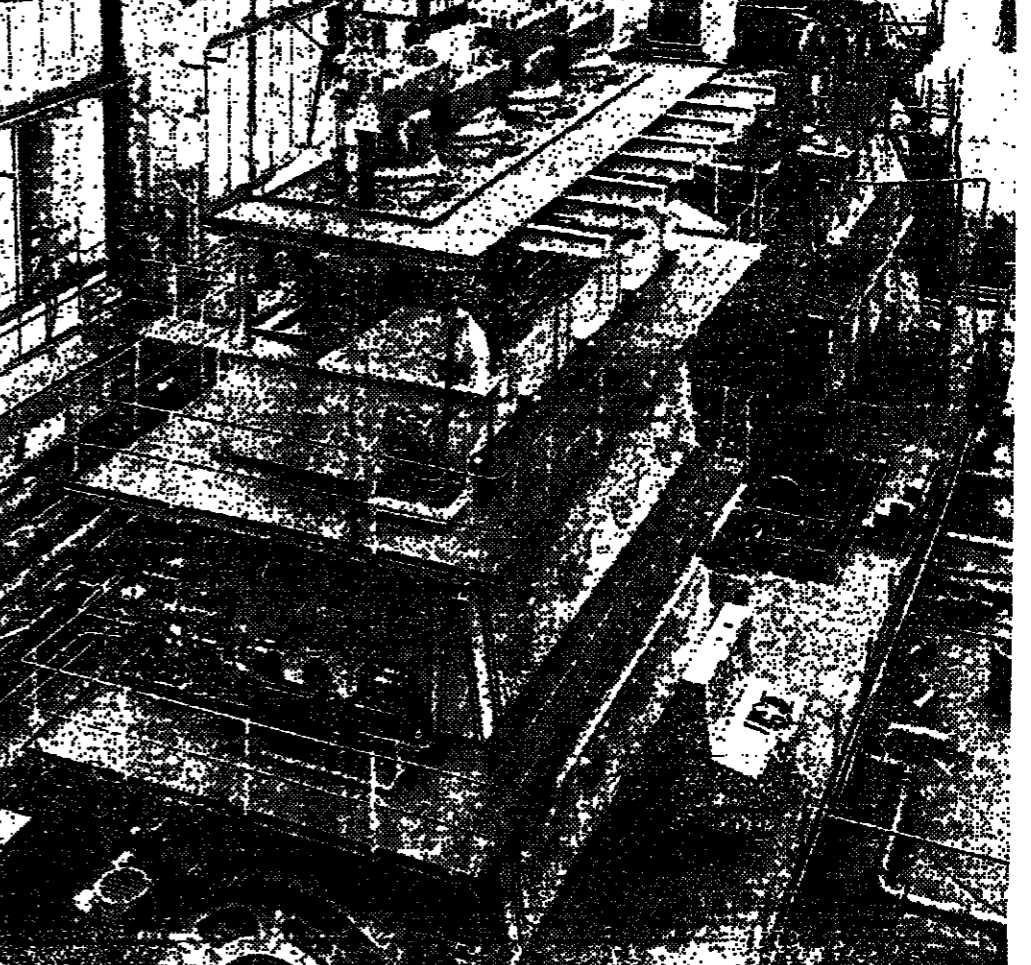
Whether the turbine manufacturers can reverse this recent trend in the light of the new fuels debate remains to be seen—they have certainly not shown any lack of intent.

Shipowners cannot afford to ignore such calculations when the larger companies' annual fuel bills range between £30m and £100m, especially in times as hard as now.

Looking further ahead to the end of the century it is impossible to make predictions. Will nuclear propulsion, already proven technologically for warships...

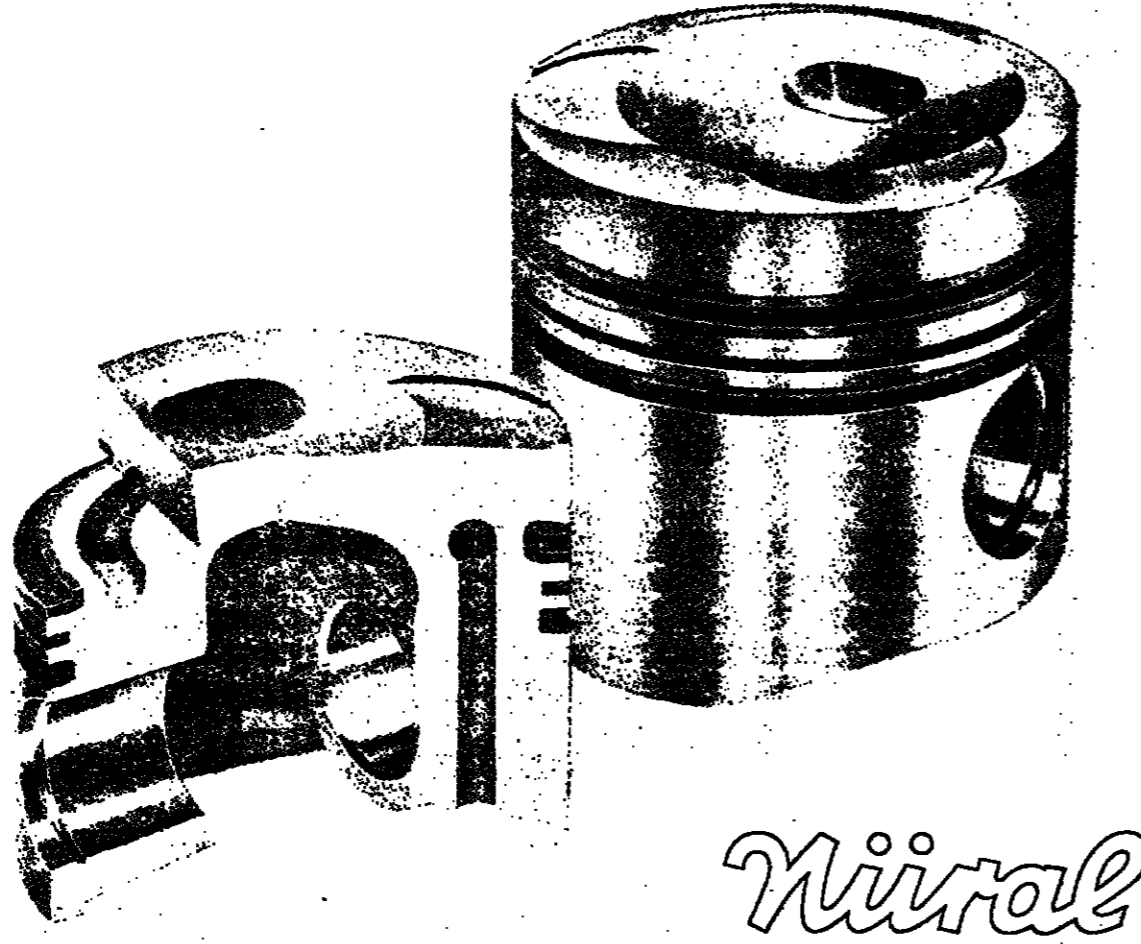
conditions necessary for economic reasons for many ships in today's market, the diesel companies are adamant that the technology is on-hand to design for such flexibility where required.

advantages to justify the extra fuel cost? Certainly, these forms of propulsion could be of interest for specialised functions such as ice-breaking gas carriers...



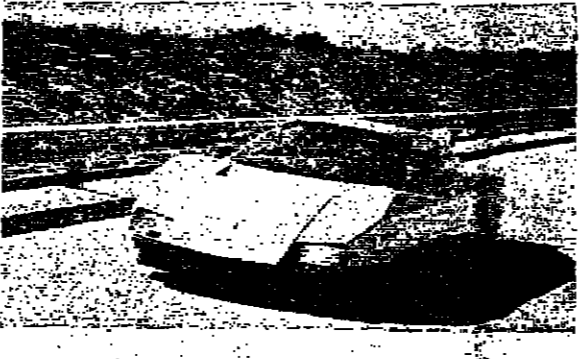
A recent Doxford opposed-piston engine on test in Sunderland. It is the only all-British marine engine built at the British Shipbuilders' works

New World Records by Mercedes Turbo-Diesel fitted with Nueral-Pistons



Nueral oil cooled piston

A further nine world records have been established by the new Mercedes C 111-III five-cylinder turbo-charged diesel engine using Nueral oil-cooled pistons.



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A growing demand in small boats

ONE SECTOR of the market which the diesel engine manufacturers believe will continue to grow world-wide in a useful, if not spectacular, fashion is the small marine diesel.

There are still a few companies in the market offering trusted engines designed purely for marine propulsion. Usually they are heavy, slow-revving, and designed for a life-time of arduous service.

Several manufacturers are developing lightweight small diesels to compete with the Petters, the Japanese Yanmar and a few other designs sharing the market at present.

The second reason for brisk demand for diesels in the Third World is the newly fashionable policy of reinforcing local fishing industries by providing better equipment for inshore fishing.

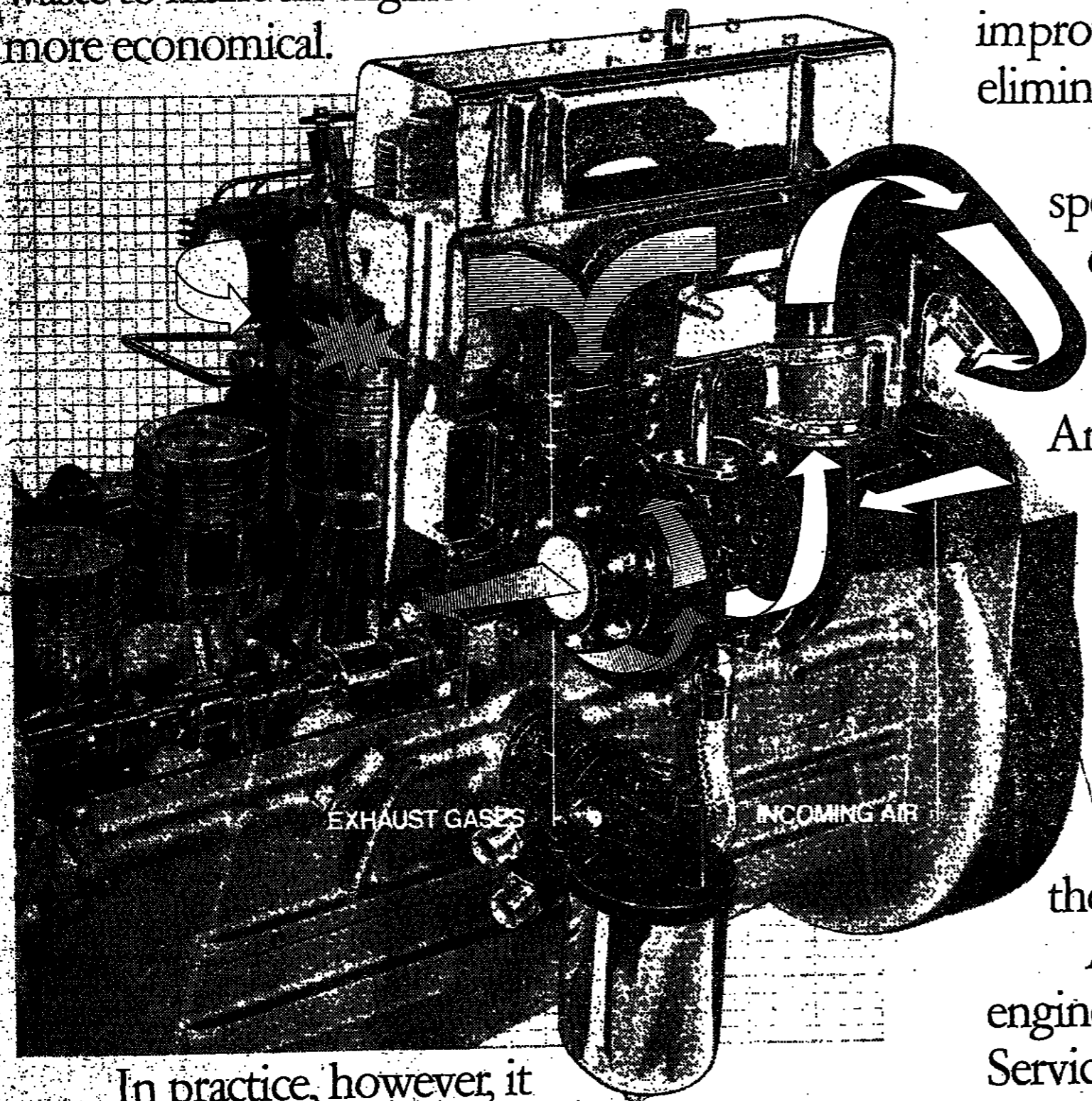
Some companies are starting to straddle both philosophies. Petters, a Hawker Siddeley subsidiary, recently produced the lightweight marine diesels—the 6 hp Mini-Six and the 14 hp Mini-Twin...

Designers are calling them "wide cut" fuel engines, meaning that they will be able to run on a wide-cut fuel fraction sliced from crude oil during the refining process.

Roy Hodson

LEYLAND 6-98 TURBO. NOW THE PRINCIPLE WORKS TO PERFECTION.

Turbocharging is a great principle. In theory, it gives you something for nothing. It uses energy which would otherwise go to waste to make an engine more efficient and more economical.



In practice, however, it has often made engines less reliable.

Not any more. For the past four years Leyland have been developing a turbocharged engine that offers all the benefits. And none of the problems.

It's called the Leyland 6-98 Turbo. To make it we didn't just fit a turbocharger to an engine. We redesigned our engine to fit a turbocharger.

In the development of the 6-98 Turbo, we made many vital design improvements.

Nitrided crankshaft, chrome flash liners, and toughened crankshaft clamps all increase durability.

Redesigned pistons with iron inserts improve oil consumption, and stronger castings eliminate head and crank case problems.

Even the turbocharger itself has a special lubrication system, to prevent overheating.

We tested all the improvements we made. Rigorously. On the bench. And, for the past year, on the road under actual operating conditions.

What's more, many of these improvements have been carried over into the rest of the 98 series engine range.

So they're all better. Tougher and more reliable than ever. From the 69bhp 4-98 naturally aspirated engine through to the 137bhp 6-98 Turbo.

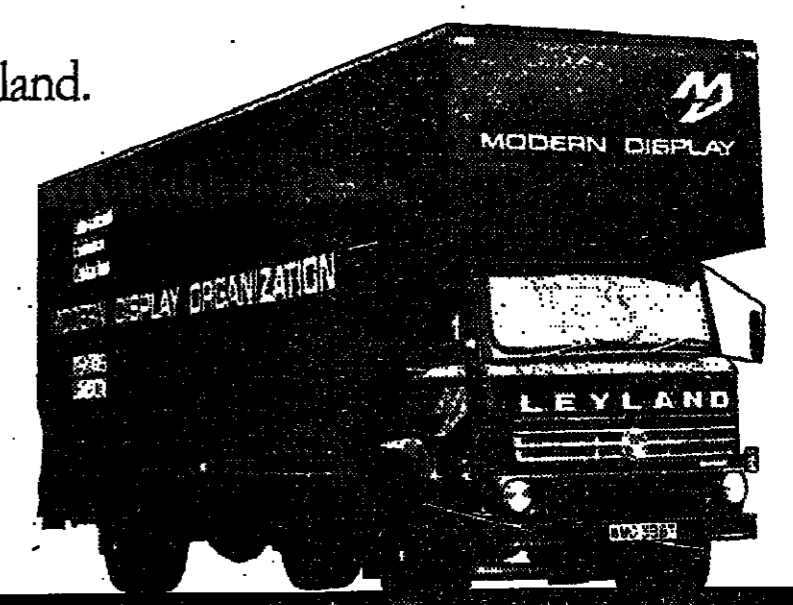
And like all our trucks, the 98 series engines are backed by the biggest Parts and Service network in the business.

Get in touch with your nearest Distributor.

And see for yourself how well the 98 series engines power the FG, Terrier and Boxer to perfection.

Leyland Vehicles.

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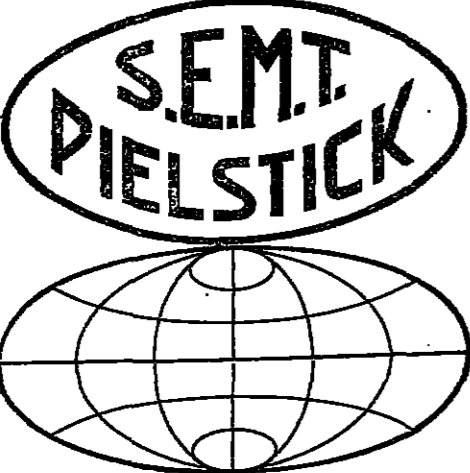


98 SERIES ENGINES POWERED TO PERFECTION

DIESEL ENGINES VIII

The diesel engine industry is an international business, with most of the leading Japanese, European and American companies competing actively in each other's markets. On this and the following six pages the state of the industry in the main producing countries is examined, along with profiles of some leading companies.

Strong point of Britain's engineering industry



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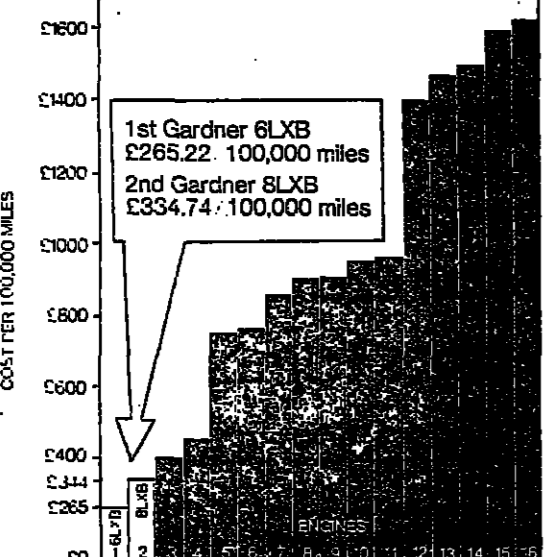
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DIESEL ENGINES are among the strong points of the British engineering industry. It is one of the few sectors in which UK production matches or possibly exceeds that of West Germany. In Perkins Britain has Europe's largest manufacturer of diesel engines. Most of the other UK-based producers are strong in their particular sectors of the market. In contrast to some other areas of mechanical engineering there is no lack of powerful and well-financed companies which have invested heavily in diesel engine manufacture and are continuing to do so.

Yet despite these assets Britain's share of the world diesel engine market has tended to decline in recent years. Whether this trend can be reversed depends on two factors, one of which is outside the direct control of the engine manufacturers. The first is the competitiveness of the UK-based original equipment manufacturers (OEMs) who instal diesel engines in their machinery. The second is the ability of the engine manufacturers to establish worldwide sales and service networks of their own.

In the range up to 30 hp Britain is well placed, having two companies, Lister and Petters (both part of the Hawker Siddeley Group), with a worldwide reputation in their field. There is strong competition from the Italians and Germans, while Japanese companies, led by Yanmar, have done well in the Far East and other developing countries. Kirloskar of India is also a significant competitor.

The biggest battleground in the next few years is likely to be in the 30-500 hp category. Several of the major engine manufacturers are directly associated with OEMs who provide the base load of their business. Thus Perkins is owned by Massey-Ferguson and about 40 per cent of its UK engine production is used in Massey-Ferguson equipment. Ford, the second largest diesel engine manufacturer (it makes around 250,000 engines a year in the UK compared with Perkins' worldwide output of some 550,000), has a large captive outlet in its own tractors and trucks which has enabled it to build up a growing industrial engine business with outside customers. The Dorset range covers a power band from 65 to 250 hp and the York range goes from 54 to 80 hp.

Even those engine producers which do not have a captive outlet for their products depend for an important part of their sales on UK-based manufacturers of original equipment. If, for example, iron makers like EBF, Fodens and Seddon-Atkinson were to disappear from the scene because they could not compete against foreign suppliers like Volvo or Daimler-Benz, this would be a serious blow to the engine suppliers—Cummins, Gardner and Rolls-Royce Motors. If major construction equipment makers like J. C. Bamford or Aveling Barford either went out of business or were swallowed up by large U.S.-based companies with their own engine-making capacity, this too would weaken the foundations of the British diesel engine industry.

Concern

So the fact that about half the UK market for heavy-duty trucks is supplied by imports is a matter of serious concern for the engine builders. Equally, the British motor industry has not so far made much of a contribution to the development of diesel-engined cars—though in this case the engine is more likely to be made by the vehicle manufacturers than by outside engine suppliers.

The one end-equipment sector in which Britain is unusually strong—farm tractors—unfortunately happens to be the one with the least exciting growth prospects. Britain is easily the largest exporter of tractors, but the principal manufacturers, including Perkins' parent Massey-Ferguson, have been hard hit by a weakening of demand in several key markets. Most forecasters predict a rather modest growth rate for diesel engines in tractors and related applications over the next decade.

In generator sets, another important outlet for diesel engines, there is a strong UK-based industry, with companies like Dale, Petbow and Dawson Keith enjoying a substantial export business; several of the

also a number of smaller truck makers which do not make their own engines; SISU in Finland, for example, buys engines from Leyland and Rolls-Royce Motors in Britain.

The hope is that Continental truck manufacturers which now use their own engines, like Renault Industrial Vehicles in France, can be induced to switch to an independent engine supplier. Cummins supplies engines to Ford for use in the Transcontinental truck, which is assembled in Amsterdam. British engine manufacturers are discussing possible supply arrangements with several Continental truck companies.

From time to time there have been suggestions that the UK-owned sector of the diesel engine industry could benefit from rationalisation—that is,

PRINCIPAL UK MANUFACTURERS

Company	Parent
Perkins	Massey-Ferguson (Canada)
Ford	Ford (U.S.)
Vauxhall/Bedford	General Motors (U.S.)
Cummins Engine	Cummins Engine (U.S.)
Rolls-Royce Motors	
Leyland/Rover/Austin Morris	BL
APE-Allen	Amalgamated Power Engrs.
APE-Crosley	
Dorman	General Electric Company
Ruston	
Paxman	
Kelvin	
Lister	Hawker Siddeley
Petters	
Gardner	
Mirrlees Blackstone	British Shipbuilders
Doxford	



The Liner Giraffe powered by a Ford 2711E four-cylinder diesel engine

from mergers—to achieve greater economies of scale. When Rolls-Royce Motors acquired a minority holding in Gardner and later made an unsuccessful bid for Fodens, the heavy truck company, some Government officials were attracted to the idea of a three-way link-up leading to an integrated truck and engine manufacturer, a small-scale version of Detroit Diesel in the U.S., which supplies engines to its parent company, General Motors, as well as to outside customers. But the Gardner Motors' approaches and in any case Fodens was seen more as a means of diversification for Rolls-Royce than as a captive outlet for its engines.

With Gardner now firmly in the Hawker Siddeley camp Rolls-Royce Motors is pursuing an independent strategy as a specialist supplier of engines to automotive and non-automotive markets. The range of 200 to 1,200 cc and the new Vee-form engines coming on stream at the Shrewsbury factory, complementing the established in-line range, will widen Rolls-Royce's markets. Capacity, now around 6,000 engines a year, is expected to rise to more than 10,000 engines in the early 1980s.

Mergers between UK-owned engine manufacturers are probably not very relevant to the industry's attempts to expand its share of world markets. It is interesting that GEC and Hawker Siddeley, both of which have several diesel engine manufacturers within their portfolio, have not attempted to rationalise them; each company remains responsible for designing, making and selling its own products. Especially in the higher horsepower ranges, the diesel engine industry affords opportunities for the small-volume specialist who carefully cultivates his chosen customers. APE-Allen, the Bedford-based subsidiary of Amalgamated Power Engineering, is one such company, with diesel engines ranging from 400-1100 hp. Its sister company, APE-Crosley, makes larger engines for marine and stationary applications; it is a Pielstick licensee.

What may make more sense than mergers between British companies are acquisitions of, or partnerships with, overseas companies as a means of developing new markets. It was this thinking that led GEC to acquire Baudouin in France and Alco in the U.S. Hawker Siddeley, too, has made acquisitions in the U.S. The diesel engine manufacturer needs to be in a position to service his existing OEM customers, who may be exporting their equipment throughout the world, and to develop new OEM business, both require a substantial investment overseas, often including local manufacturing facilities.

Yet, however successful the UK-based engine makers are in developing direct exports, they need a strong home base in the form of British OEM customers who can hold on to the bulk of the domestic market and compete internationally. In this context the future of the motor industry and of the truck makers, in particular, is of crucial importance. Both Ford and General Motors (Bedford) have made Britain their main European production base for commercial vehicles and this is unlikely to change.

But the outlook for Leyland Vehicles, which has just undergone another change of top management, is less certain. There has been talk of partnerships between Leyland Vehicles and other European truck manufacturers; it is not clear how such an arrangement might affect Leyland's engine production. Another possibility, in view of the cash limitations to which the whole of BL is subject, is that Leyland Vehicles should gradually increase its output of engines produced by outside suppliers, rather than investing in major new engine developments of its own.

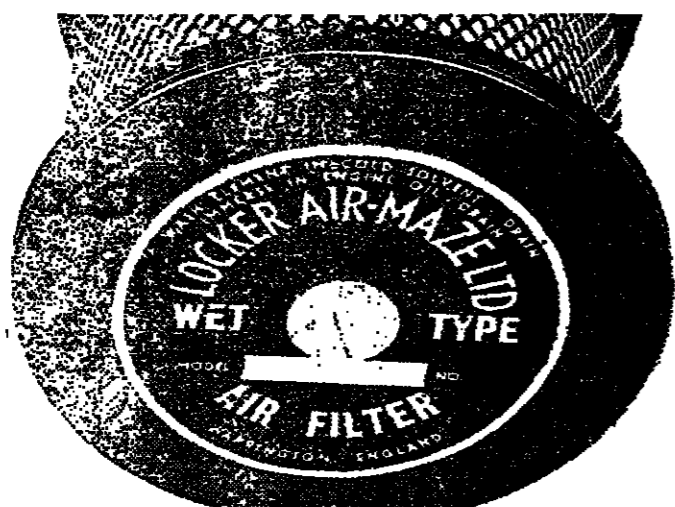
Disappointing

In the meantime Leyland is actively developing its engine sales to outside customers, under the "Power Systems" banner. The aim is to provide from the UK a third force in world markets alongside Perkins and Ford.

It is clearly in the interests of the diesel engine industry that the competitiveness of the British heavy truck manufacturers should be improved, and the tide of imports pushed back. It is disappointing that while other European companies, including Iveco, Volvo and Renault, are making plans to sell their medium and heavy-duty trucks in the U.S., there is no British participation in this market. Equally, it is important that BL's belated entry, or re-entry, into diesel-engined passenger cars should be successful.

The conclusion seems to be that the UK-based diesel engine manufacturers must do all they can to help the end-equipment makers improve their performance, while at the same time spreading his risks through the development of new OEM customers overseas.

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Big changes ahead in the UK marine sector

THE SLOW-SPEED marine diesel engine industry in Britain is now entirely nationalised, with the takeover in July 1977 of the six engine builders in England and Scotland.

These companies—Barclay Curle, J. G. Kincaid and Scotts Engineering on Clydeside, and Doxford, George Clarke/NEM and Hawthorne Leslie on the North-East Coast—are now part of British Shipbuilders (BS). Their only domestic competitor in the slow-speed field is Harland and Wolff of Belfast, also State-owned, and licensed to manufacture Burmeister and Wain slow and medium-speed engines.

This major reorganisation could hardly have been expected to occur without severe convulsions, especially as the BS companies were taken over at a time when their order books were being depleted to the point at which they now have only three months work in hand.

So far there have been two important developments since nationalisation. The first was the decision to take Barclay Curle, the second smallest of the BS companies with an annual capacity of 72,000 bhp out of engine building altogether. This company is now in the process of moving into BS's general engineering division and for the foreseeable future will be working as a subcontractor for defence products to Vickers Engineering.

The second big step was the separate decisions by British Shipbuilders and Harland and Wolff to attack the medium-speed marine diesel market.

Harland is now licensed to build Germany's MAN medium-speed engines and British Shipbuilders similar designs from Sulzer and Stork Werkspoor. In spite of a chronic shortage of funds, BS has invested in new plant to allow Hawthorne Leslie to lead its medium-speed challenge.

The private sector of Britain's marine diesel industry reacted strongly to these licensing developments and explored the possibility of suing British Shipbuilders for exceeding its powers.

This proved to be a legally untenable course of action and the private manufacturers, which include such famous names as GEC, Amalgamated Power Engineering (APE) and the Hawker Siddeley subsidiary Mirreles Blackstone, are seeking new ways to press their campaign. Their fear, obvious enough, is that a hard-pressed British Shipbuilders will persuade shipowners placing contracts with its yards to specify engines built in its own shops, even though these are entirely of foreign design. The private companies have relied on the State-owned shipyards for half their business up to now.

With current worldwide medium-speed production capacity more than three times in excess of demand, the private sector is dismayed at any increase in domestic capacity. The effect, they argue, will be to destroy two private sector jobs for every one saved within British Shipbuilders.

So far, however, British Shipbuilders has not won any orders under its new licences and APE at least finds itself with one of the healthiest order-

books in the UK industry, although the prospect of nine months security of workload is hardly a matter for comfort. APE builds engines of its own design and under licence to Pielstick of France.

The changes so far in the industry since nationalisation are likely, however, to be dwarfed by the changes to come. British Shipbuilders will in the course of this year be attempting to apply the terms of its first corporate plan.

Planning

Planning has to start from the fact that most of the engine builders are financially weak and have suffered in the past from chronic underinvestment. Before nationalisation the UK Government displayed precious little interest in its marine engine industry and by a process of too little investment and research too late effectively killed off Britain's marine steam turbine industry. British power engineering companies like GEC and Babcock and Wilcox retain some interest in the marine field but certainly Britain would be poorly placed to take any share in the revival of interest in steam turbines which some sides of the industry are confidently predicting.

On the diesel engine side British Shipbuilders' five companies (excluding Barclay Curle) retain a physical capacity of just over 700,000 bhp per annum, but present labour levels mean a practical capacity of 200,000 bhp below this. Typical output in recent years has been between 300,000 bhp and 450,000 bhp—the latter achieved in 1976, the best year.

Total slow-speed completions for BS companies are expected to bottom out at around 320,000 bhp in 1979-80, but recover to 450,000 bhp by 1982-83. Medium-speed output is projected at between 21,000 bhp and 42,000 bhp.

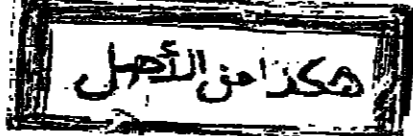
It is clearly possible on the basis of these projections—assuming they are accurate—for British Shipbuilders to continue its operations very much on the existing pattern, with a need to shed only a small amount of labour for a temporary period of about two years.

BS executives, however, clearly favour using the recession to regroup and rationalise engine building activities to produce larger, stronger, and more competitive units for the future.

To this end it seems certain that there will be an amalgamation of Scotts and Kincaid on the Clyde and of Hawthorne Leslie and George Clarke. Much more controversial, and therefore less likely to prove politically acceptable to British Labour Government, is a further option under study to close down the Doxford company in Sunderland, with the loss of 1,000 jobs, and put production of Doxford-designed engines—the only pure British slow-speed designs in existence—into Hawthorne Leslie.

If this happens, it would be a sad fate for Doxford, which after a number of very lean years has successfully developed, tested and now received seven orders for what it regards as a breakthrough in the smaller end of slow-speed design.

This Doxford 58JS, a three-



PROFILE-PERKINS

The world's major manufacturer

PERKINS IS the world's major diesel engine manufacturer. Last year about 560,000 Perkins engines were made and the group has the capacity to make more.

The range of Perkins diesel engines runs from 30 hp to 255 hp and its products are specified as original equipment by more than 800 of the world's leading manufacturers of vehicles, agricultural machinery, construction machinery, industrial equipment and marine craft.

There are about 85m Perkins engines in operation in more than 2,000 different applications throughout 163 countries.

The group's 4,200 industrial engine is the most widely used diesel lift truck engine in the world. In all Perkins claims that its engines are used in more than 20 per cent of the world's material handling equipment, 10-95 per cent of diesel combines, 31 per cent of wheeled tractors, 10 per cent of commercial vehicles, 10 per cent of generating sets and 8 per cent of pleasure craft. If Japan is excluded, it also has 14 per cent of the compressor engine market.

Around 40 per cent of Perkins' output goes to the present economy. Massey Ferguson of Canada for use in agricultural and construction equipment. Of the 300,000 of 50 engines Perkins sold to organisations outside M-F last year, 10 per cent went to Asia, 8 per cent to the Middle East and Africa and 36 per cent to Latin America.

Licence

Perkins has four wholly-owned plants. The biggest is at Peterborough in the UK, and the others are in Brazil, where current output is around 50,000 engines a year, the U.S. (Canton, Ohio), where production is about 20,000, and West Germany where capacity is 26,000 a year. However, Perkins engines are made in 19 countries all told. In 13 of them Perkins has less than a 50 per cent shareholding in the manufacturing concern or they are being produced under licence.

Perkins was founded by the late Mr. Frank Perkins in 1892 in Peterborough. During the Second World War the company expanded dramatically. In 1959 it was acquired by Massey-Ferguson.

M-F's recent problems have affected Perkins. The parent group increased its debt load so as to expand, particularly

into the construction equipment business, and then was caught by a downturn in nearly all its operations. (Perkins contributes about 14 per cent of M-F's total annual sales of around \$3bn compared with the agricultural equipment operations' 73 per cent.)

The parent group has been nationalising its construction equipment business but Perkins is definitely not included in any disposal plans.

Last financial year, which ended on October 31, Perkins' sales jumped by about 20 per cent in value to more than \$740m. And according to Mr. Michael Hoffman, the chairman and managing director, Perkins remained profitable.

But the main plant at Peterborough has felt the effects of the same weaknesses in demand which has caused M-F problems. Peterborough is the only Perkins plant offering a full range of engines and components. In the 1977-78 financial year (ending in October) output was about 200,000 engines compared with 220,000 in 1976-77 and a peak of 269,000 in 1975-76.

The Peterborough workforce, which once totalled 12,000, has been gradually reduced, mainly by natural wastage, and is now down to 9,600.

In spite of M-F's problems, Mr. Hoffman says that Perkins expects to maintain investment at Peterborough in real terms. This would involve lifting the \$18m spent in 1978 to around \$22.75m.

Mr. Hoffman says the group is expecting worldwide an 8 per cent increase in unit sales to third parties next financial year while sales to M-F should go up by about 3 per cent.

One of Perkins' keys to success has been the flexibility of applications for any one engine type. To take but one example, the 6364 unit is used in tractors, buses, pleasure and work boats, earthmovers, generator sets, compressors, and also a range of agricultural equipment.

This flexibility is the reason that Perkins has been able to penetrate that almost impenetrable market, Japan. Some 99 per cent of the diesel engines bought by Japanese users come from Japanese manufacturers. But Perkins has the odd one per cent of the market thanks to the marine application of its diesels.

Perkins in Japan is linked with another local diesel engine manufacturer Yanmar. Yanmar is strong in the 5 hp to 30 hp engines for rice paddy tillage machinery as well as in heavy

engines at the top end of the horse power range. Perkins has light-weight, high-speed 30 hp to 350 hp engines so the two ranges are complementary.

Perkins belief is that it should make sure it builds up a reasonable presence in Japan because sooner or later the Japanese diesel engine exporters will be making a very large impact on the third-world, third market countries in which Perkins currently predominates.

The Yanmar relationship is a good example of the principle that a European exporter's best agent in Japan may often be a company in the same industry but with a different range of products.

In the developing countries,

Perkins is constantly negotiating about possible local manufacture which most of them now insist upon. At the end of last year, for example, discussions were in train in Colombia, Egypt, Indonesia, the Philippines and Taiwan as potential new manufacturing territories—in partnership with local governments or interests—and talks about a possible new joint venture in Pakistan where it already had a license, were also going on.

Mr. Roger Clark, director of sales and marketing, says that the multi-purpose diesel engine has an important part to play in the future of the developing countries.

"There is a need for human-sized projects rather than

'superhuman' schemes like power stations and airports. Introducing simple diesel power can give people light when it is dark, pipe fresh water to them, help with the transportation of goods, improve fishing and the turning of soil," he adds.

He recalls that the mechanisation of 2,300 fishing boats—by the addition of small diesel units—turned Sri Lanka from a net importer of fish to a net exporter, while employment in the industry increased.

But the developing countries need simple diesels. "There is a limit to the technology you can remove from a diesel engine. But to the maximum extent possible the engine

should be simplified for the developing countries."

Apart from the developing countries, Perkins is also well-represented in the Eastern bloc countries. A new engine manufacturing facility at the Ursus tractor plant near Warsaw in Poland which has been completely refurbished by M-F and Perkins recently came on stream.

And, of course, contacts have begun with the new outward-looking Chinese Government—significantly at the invitation of the Chinese themselves.

There is a great deal of excess capacity in diesel engine industry, as there is within Perkins itself. The Brazilian

plant has produced over 64,000 engines in a good year while the U.S. facility, without much additional investment, could be taken to a 100,000-a-year capacity, the same as Brazil.

But the group does not believe its forays into the developing countries or the Eastern bloc will contribute to over-capacity problems because by 1981 or thereabouts it expects current surpluses to have been mopped up and suggests there could well be a shortage.

In any case, most of the countries we are looking at are those where a big growth in demand for diesel engines can be expected," comments Mr. Clark.

One part of the diesel engine market that Perkins will continue to ignore, even though it offers in the medium-term the greatest growth in demand, is that for car diesels.

As far as Perkins is concerned the market will either be too small to justify the research and development investment to produce a diesel tailored specifically for cars, or demand becomes so huge that the car assembly groups will design and build their own diesel engines. Either way there would be no profit in it for Perkins.

K.G.

Fierce competition in generators

THE UK ranks with the U.S., West Germany and Japan as one of the world's leaders in the design and manufacture of diesel generator sets. It is actively export-oriented, and has wide experience in world markets. Yet it is this very posture which is causing it some difficulties at present.

The world market is reckoned to be worth between £150m and £200m annually, of which UK manufacturers might take between 15 and 20 per cent. Yet their strengths have been in certain countries which for a variety of reasons have cut back generator orders to a small proportion of their former levels. The three major countries in this category are Iran, Iraq and Nigeria. In the case of Iran, ordering was falling away even before the current wave of troubles, and tariffs had shot up. Iraq has imposed a general boycott of UK goods. Nigeria, which at its peak took an estimated 25 per cent of UK production, has raised its import charges from 5 to 50 per cent and raised the minimum deposit of letters of credit from 30 to 100 per cent.

All the UK manufacturers—and others around the world—have felt the pinch, and in direct proportion to the extent their production was export-bound. Petbow, for instance, which reckons that as much as

80 per cent of its production is for the export market, has had to lay off some 100 of its workforce.

These countries were good markets because (a) they lacked a comprehensive national grid and (b) they were comparatively well developed (and developing fast, at least in certain sectors) and thus required generator sets for plants or villages. However, in adverse times, as a number of the manufacturers ruefully admit, it is capital equipment which is hit first. "We have suffered early from the contraction in certain markets," said a Petbow executive, "other manufacturers have still to feel the full effects." More optimistically, the same manager saw an early upturn again for his industry, and says that the UK industry has not suffered any more than any other, and is thus relatively as strong as ever.

There are of course other markets, both in the Middle East and in Africa, as well as in Latin America and the Far East. China inevitably crops up in the projections for future markets. Europe itself is naturally a more difficult sales area, since most European countries have developed diesel engine and generator set industries of their own. But it is by no means a closed market and Perkins, the Peterborough-based world leader in diesel engine produc-

tion says that the sets using its engines sell well in Germany, France and Italy.

Perkins reckons it supplied more than a third of the engines to the nearly 13,000 diesel sets manufactured in the UK last financial year. It ascribes its success with export-oriented companies as being due to the network of agents and distributors it maintains in almost every country in the world, and to its newly adopted "care-card" scheme. This operates by having a card attached to the engine which is detached by the end-user and sent to the local Perkins agent, who is then responsible for servicing.

Mr. Brian Gomm, Perkins' UK sales manager, reckons that servicing is extremely important in the market. "The engines themselves are fairly simple. There are two crucial components—servicing and price. It is a very highly competitive industry on price, and it is internationally competitive. After price, we can only compete on servicing, and to be efficient at that you have to have world-wide coverage. The engine is 40 per cent of the worth of the generator set, and it's the most important part. If you can offer good after-sales service to the customers of the set manufacturers, then you'll keep your market and expand it."

competition is reckoned to be so fierce is that diesel engine manufacturers, especially those in the U.S., have considerable surplus capacity. This in turn is because they have anticipated an earlier conversion by the automotive industry to diesel power. Though this move is now strengthening, it still leaves too much production chasing too few customers. Hence the major manufacturers, like the U.S. companies Cummins and Caterpillar, are pushing hard in the diesel generator market. This has a two-fold effect on UK set manufacturers—where their competitors manufacture sets, they find the competition all the fiercer. However, where they sell engines, they find that these components are available at prices lower than they would be otherwise.

"We are in a very cyclical industry," says Mr. Peter Varley, Petbow's marketing director, "we are easily influenced by political events world-wide. The industry has had a considerable setback over the past year, but it has taken measures to cope with the adversity and I think we're set for a rise again soon. The demand for generator sets in the developing world is very strong and the long-term trend is up. There have been political and economic problems only on the short term."

The buyers include factories, offices, local authorities and of course computer companies, where instant stand-by power is essential. So important has this part of the market become that in the view of some in the industry, it may wholly compensate for the loss of trade in the export market if there is a "winter of discontent"—as the industry refers to it—in the months ahead. The UK market is currently reckoned to be worth around £20m, and may grow substantially.

The major UK manufacturers include the General Electric Company (GEC) and Hawker Siddeley, together with the

independent companies of Petbow, Dale, Dawson Keith, G and M and Welding Industries. The first two are of course groups: GEC's diesel companies are Dorman, Kelvin, Paxman and Ruston in the UK, with Baudouin in France and also in the U.S., of which the latter has a considerable presence in generator sets. Hawker and the Lister, Pettors, Gardner and Mirlees Blackstone diesel subsidiaries.

Dale, Petbow, and Dawson Keith, by contrast, are specialist set manufacturers, using engines from a variety of suppliers, including Perkins, Rolls-Royce and Cummins in the U.S. All make both standby and base-load sets, with some production too of small transportable sets. The major independents each employ between 700 and 1,000 workers, and are strongest in the small to medium sets, from around 25kW to 2MW.

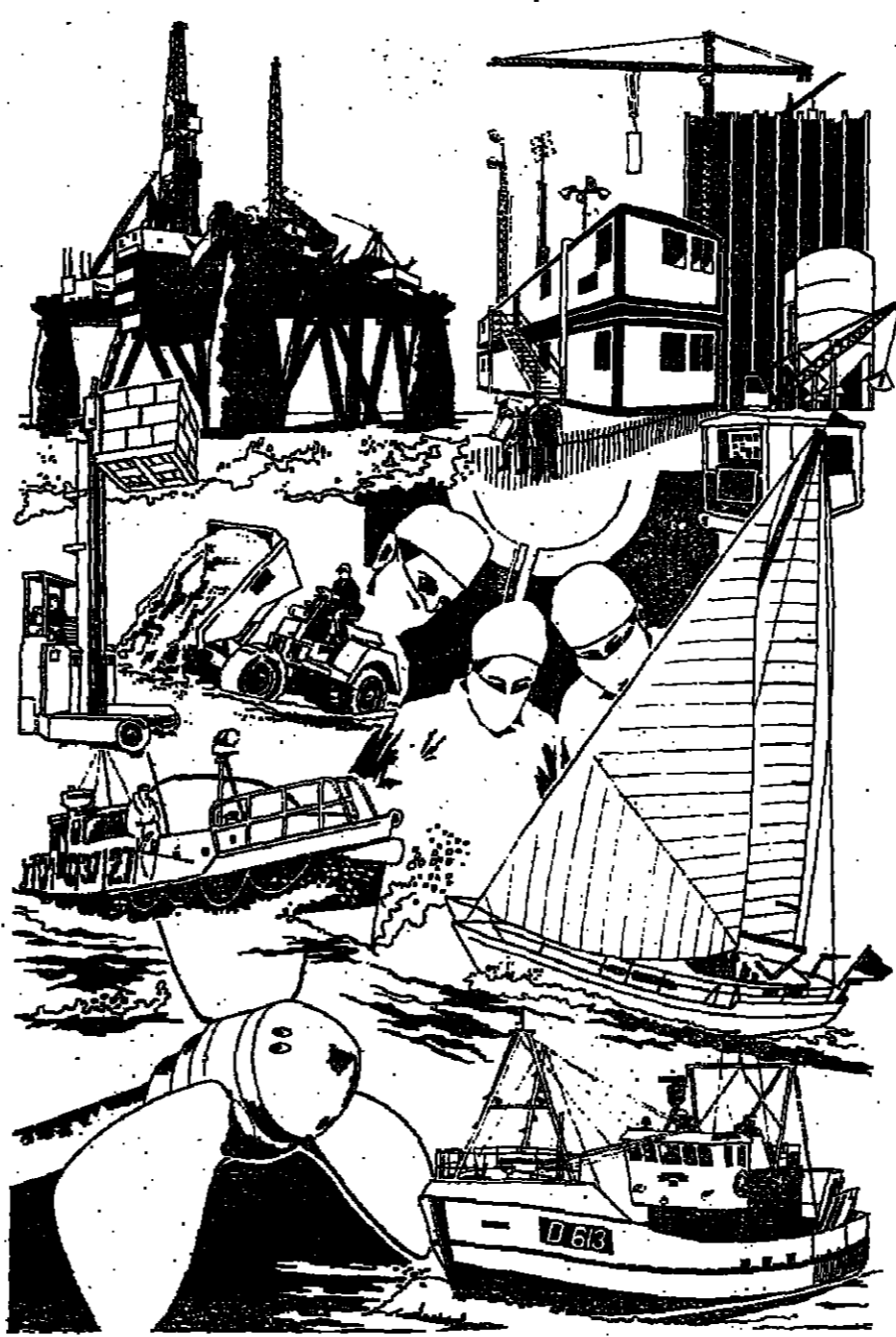
Forecasting future trends is dangerous, says industry executives. The more optimistic quote the view of stockbrokers Laurence Prust, who believe that the present weakness in the world market is the last of a long series of hiccups. Others say that better times will wait on an upturn in Third World buying power, or a prolonged growth of power engineers' or coal miners' strike.

John Lloyd

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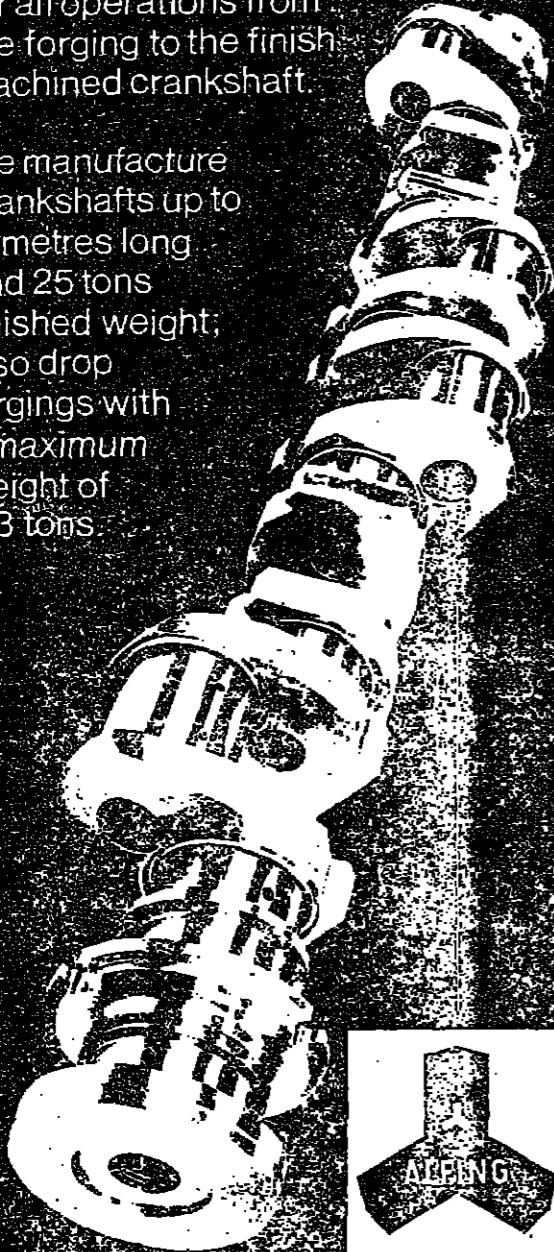
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West Germany's team

DIESEL ENGINES X

THE WEST GERMAN diesel engine industry is strongly represented in all horse power categories, from the smallest to the largest. The engine manufacturers have the advantage of a large home market: German original equipment manufacturers are for the most part loyal to their domestic suppliers and it is not easy for British, French or Italian manufacturers to gain a significant share of the market, although several of them are trying hard to do so. Both the engine makers and their customers have been affected to some extent by the rise in the Deutsche Mark and this has probably helped to stimulate moves to establish overseas production facilities, particularly in the U.S.

The company with the widest range of engines is Deutz, part

of Kloeckner Humboldt Deutz (KHD), the subject of a separate profile on this page. With more than 32,000 employees KHD had a worldwide turnover in 1977 of about DM 4bn. It is the world's leading manufacturer of air-cooled diesel engines, a major producer of tractors and farm equipment and—its fastest-growing business—an international plant contractor, particularly in the field of non-ferrous metals and cement. What has been its fourth leg, Magirus-Deutz commercial vehicles, is now part of Iveco, in which KHD holds 20 per cent and Fiat the rest.

In the lower horse power ranges, below 30 hp, the two major producers are Hatz and Faymann, direct competitors to Lister and Petters in the UK and to Lombardini and

Ruggerini in Italy. Hatz has made a particular speciality of "denoised" diesel engines, with a new generation of air-cooled 2, 3 and 4 cylinder engines in the range from 10 to 60 hp. Hatz, Faymann and Deutz small engines are widely used in construction equipment and a variety of other industrial applications.

In the high volume 30-500 hp category Deutz is again a strong contender, but the largest producer in Germany is Daimler-Benz. This company has a big internal requirement for diesel engines in its own commercial vehicles and cars; in 1977 Deutz as an independent diesel engine producer, similar to America's Detroit Diesel, which is a subsidiary of General Motors and supplies GM heavy trucks but operates as an autonomous company.

Deutz supplies engines for Magirus-Deutz trucks, but this now forms part of IVECO, the European truck group, in which KHD has a 20 per cent interest, with the balance held by Fiat; Schutz deals with IVECO "just like any other customer."

Competitor

Another German car manufacturer, BMW, is engaged in a joint venture with Steyr-Daimler-Puch of Austria to produce diesel engines. MAN is a strong competitor in two distinct segments of the

diesel engine market. It is one of the leading European suppliers of low and medium-speed engines for marine and power applications. The four-stroke engine group consists of five engines that provide ratings between 1200kW and 23,550kW and the two-stroke group offers four engines covering the range between 5,540 kW and 32,400kW. In addition, MAN produces the D25 family of high-speed diesels for use in its own and other companies' commercial vehicles; it is also used in heavy construction equipment, boats and generating sets.

MTU (Motoren-und Turbinen Union) produces engines in the range 400-7,000 hp and its annual output is about 2m hp. Some 47 per cent of MTU diesels are used in ships, 42 per cent in heavy vehicles, 8 per cent in

generating sets and 2 per cent in rail traction. MWM (Motoren-Werke Mannheim), a subsidiary of Knorr-Bremse, produces two main groups of engine—small engines from 5 to 125kW and top speeds in the range of 2,500-3,000 rpm and large engines of 100-5,500 kW and top speeds of 400-1,500 rpm. It has extensive manufacturing interests outside Germany, including Spain, Brazil and the U.S. Finally, one of the leading European producers of medium-speed engines for marine and other applications is MaK Maschinenbau, a subsidiary of Fried. Krupp GmbH. These engines are used extensively in offshore supply vessels and in stationary applications for power generation. G.O.

PROFILE—DEUTZ

U.S. expert joins German group

A BLEND of German manufacturing and design skills plus American marketing know-how—that appears to be the thinking behind the unusual appointment last year of an American, Peter Schutz, who had worked for many years with Cummins in the U.S., to run the Deutz engine business.

"A customer-oriented marketing concept" is how Schutz describes the contribution he hopes to bring to Deutz, one of Germany's largest producers of diesel engines. With his experience of selling in a highly competitive climate where the need to understand and satisfy customers' requirements is paramount, Schutz aims to strengthen Deutz's international sales and service network and to enlarge its share of world markets—not surprisingly the U.S. is at the top of his list of priorities.

The parent company, Kloeckner-Humboldt-Deutz, divides its business into three

main segments—related to energy conversion (diesel engines and gas turbines); food production (tractors and farm machinery) and natural resources (project engineering and management)—which are run independently of each other.

The diesel engine subsidiary has two distinct sides to it—air-cooled engines ranging from three to 525 hp used in construction machinery, vans and trucks, tractors and a variety of other industrial and marine applications, and the larger water-cooled engines, ranging from 272 to nearly 10,000 hp and used mainly for ship propulsion and power generation.

Last year Deutz produced 137,000 engines in Germany and another 23,000 through licensees; less than 2 per cent of total production consists of water-cooled engines. About 20-25 per cent of the German air-cooled engine production is used "captively" in Deutz trac-

tors, Fahr combines and farm machinery.

While this business provides a useful base load, Schutz emphasises that it is done on an "arm's length" basis. He regards Deutz as an independent diesel engine producer, similar to America's Detroit Diesel, which is a subsidiary of General Motors and supplies GM heavy trucks but operates as an autonomous company.

Deutz supplies engines for Magirus-Deutz trucks, but this now forms part of IVECO, the European truck group, in which KHD has a 20 per cent interest, with the balance held by Fiat; Schutz deals with IVECO "just like any other customer."

On the technical side, Peter Schutz envisages for the next few years a steady improvement in engine performance. He points to the replacement of the 411 engine with the 511, with an increase in power per cylinder from 14 to 17 hp; similar gains have been made in the 913 (power per cylinder raised from 20 to 26 hp) and the 415F (from 28 to 32 hp). The same process is taking place on the water-cooled engines.

Schutz is looking for steady improvements in turbo-charging, combustion and the reduction of noise, as well as design modifications to make the engine easier to build.

But it is in marketing that Schutz sees the biggest scope for changes. Adopting what he calls "a very customer-oriented marketing strategy," he wants his dealers to be able to supply their OEM customers within a matter of two or three days at most. These customers are trying to cope with shorter lead times (they want to respond more quickly to their customers' needs) and at the same time they want to keep their engine stocks as low as possible. Dealers are supplied with "hub" or basic engines which can be fitted rapidly into the customers' machines.

Advantage

"Our air-cooled engine gives us an advantage," says Schutz. "It's a complete package—the nearest that an internal combustion engine can get to an electric motor."

Like most other European and Japanese manufacturers, Deutz sees the biggest growth potential in the U.S. Deutz engines have been sold in America for more than 20 years—there are over 120,000 Deutz engines in operation there—but it is only in the last few years, with the growing recognition in America of the superior fuel economy of diesel engine, that the business has begun to move sharply ahead.

Five years ago, Deutz was selling less than 2,000 engines a year in the U.S. In 1978 the figure was about 16,000 and this year Schutz expects 20,000 units. The main outlets are small construction machines, backhoes, air compressors and similar equipment; irrigation, too, has been a particularly important market for Deutz. The company likes to claim that it makes the only "heavy duty" engine below 150 hp where durability and long life is required. Deutz believes it often has the edge on the competition. But the growth in business has come mainly from markets which previously used petrol engines, not from displacing competitive diesel engines.

At this stage, Schutz is planning to tackle the American automotive market in a limited way. Domestic manufacturers such as Cummins, Detroit Diesel and Caterpillar dominate the supply of engines in the heavy truck market, but there should be scope for the smaller Deutz truck market, where the engines in the van and light operator is looking for a 15-20-year life for his vehicle. "We have decided to build engines in the U.S.," says Peter

PROFILE—SAAB-SCANIA

Rugged Swedish challenge

A MILE or so from the headquarters of Saab-Scania at Sodertalje in Sweden is a rough and hilly stretch of woodland. Intrigued visitors who have been promised a look at a lorry test area, find difficulty spotting any suitable-looking track. They are shepherded to a long bench seat at the back of a hefty SBA 111 truck, and suspicion increases as seat belts are pointed out.

Then the lorry chugs off into the heart of the woodland—and attacks a series of ferocious, boulder-strewn slopes, the toughest of which has a 60 per cent incline that would be impossible for a man to climb unaided.

The 111, with all-wheel drive, differential locks, and a twisting body frame, completes the steep climb, if not with ease, then at least with a striking show of power. Finally, hearts really do ascend to mouths, as the 111's driver insists on going down the 60 per cent hill—a test of the multiple braking systems as well as the nerves of the unwary.

It is a convincing demonstration of what can be achieved by the most rugged of Scania's truck range, and it underscores the company's commitment to diesel truck manufacture. Three basic engine sizes form the backbone of Scania's diesel range: the eight, 11 and 14-litre units. Most of these sold are now turbo-charged.

Scania, the largest part of the Saab-Scania group which also includes car and aircraft production plus medical and military equipment, sold 20,700 commercial vehicles last year. That total was made up of 18,800 trucks and 1,900 buses.

An increasingly important side of the company's activities, and one that Scania officials are

keen to stress at present, is industrial and marine engine manufacture. Last year, 5,800 such units—again the range is based on the three basic sizes of engine—were sold, 80 per cent going for export.

So the proportion of "non captive" use engines to total diesel engine output is a quarter, in line with general industry experience. Engine-makers worldwide reckon this proportion is altering quickly in non-captive engines' favour—a 50-50 mix in five years is mentioned by some—and Scania shares the general expectation, while bemoaning the lack of thoroughly reliable statistics, a common complaint.

To return to the staple truck operations, Scania puts the total number of its truck chassis variations at about 150. About 85 per cent of Scania vehicles are delivered to customers abroad.

Dominance

There are seven production centres in Sweden—11,500 of the total 18,500 Scania workforce are in the home country—and there are manufacturing plants in Brazil and Argentina and assembly facilities in Holland, Iraq and Tanzania.

Scania arrived in Brazil as early as 1953, and the company's position there has grown to one of dominance. Brazil is its largest single market, the company producing over 4,000 trucks and buses annually, and the share of the local heavy truck market has risen above 40 per cent.

The Dutch operation, based at Zwolle, 100 km east of Amsterdam, assembled 4,700 trucks in 1977. The Argentine plant, at Tucuman in the north-west of the country, opened in the spring of 1976 and output last year was 450 trucks.

Where Scania feels the draught from powerful American competitors in Europe, a whole is on the question of price. Scania naturally insists that reliability and fuel economy give it an edge over an opponent's whole working life. Strict component standardisation has been introduced to aid the former; on the latter, Scania officials claim that their engines' overall consumption advantage rises as high as 20 per cent against some competitors at the lowest point of the fuel consumption curve with one variety of the 11-litre unit.

Those who do puzzle through the statistical information available are bullish about the diesel engine's prospects. However, Saab-Scania has yet to carry its 40 years' experience of diesel engine manufacture into a range for passenger cars—this despite the major successes scored by diesel cars from rival manufacturers around the world. Saab-Scania neither produces a diesel engine car nor makes power units for other manufacturers' diesel cars.

But its important truck division, taking so much of diesel output, has been a notable success area for the company. Overall, pre-tax earnings and sales for the first half of 1978 improved 6 per cent (to the equivalent of \$35.5m and \$1.2bn, respectively), with profit margins widening satisfactorily. The truck division did a lot better than other parts of the group, registering a 19 per cent sales gain in the six months.

The target for the entire company for the 12 months was for a 10 per cent profit and sales rise, which should mean turnover ahead a quarter over 1977.

Nicholas Owen

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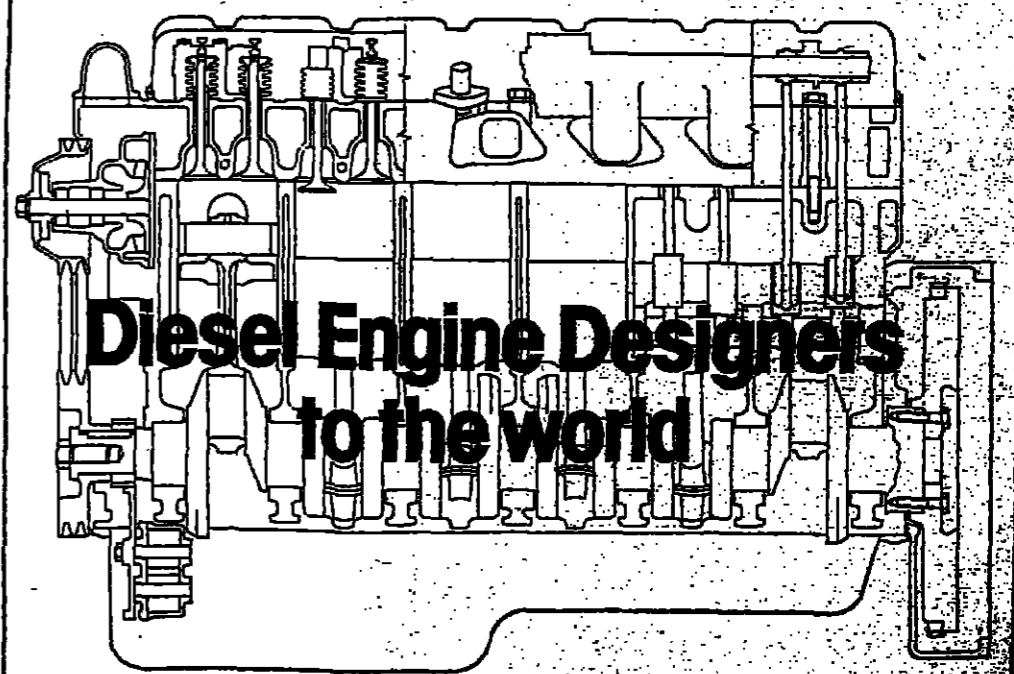
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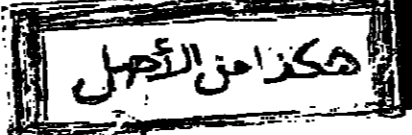
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Few bright spots in Japan

THE MANUFACTURERS of diesel engines in Japan have suffered recently from low demand from agriculture and shipbuilding which is expected to continue for some time. The only bright spots have been in supplying construction equipment—where demand has been boosted through massive doses of public works spending—and

the motor industry, which is just beginning to push diesel engines for passenger cars. The Japanese diesel industry is dominated by a handful of companies, most of which specialise and have carved out strong positions in the various specialised markets for diesel engines.

Osaka is the largest maker of diesel engines in terms of numbers, but concentrates on the smaller engines for use in construction equipment, agriculture and for marine use. Kubota of Kyoto holds the dominant share in the now depressed agricultural machinery market (70 per cent of the Japanese land-use diesel engines are for agriculture, with about 15 per cent used in construction and 15 per cent going to exports).

The industry has also been hurt by Government initiatives this year and next to cut back on the production of rice in Japan. Farmers, who are subsidised by Government-supported rice prices, enthusiastically boosted Japan's rice crop this year to record levels, creating problems of warehousing the rice. Demand for tractors, combines and planters will be down as a result of less planting. Makers are hoping to boost exports to South East Asia and elsewhere. (Tractor sales to the U.S. are good, and China is being sounded out as a market.)

In 1979, it is expected that agricultural machinery sales will fall another 15 per cent in value. Kubota, which holds about 40 per cent of the market—all equipped with diesel engines—showed a 15 per cent drop in agricultural sales in the latest half year account period ended in October.

The land-use diesel engine makers have seen production this year drop sharply. Figures compiled for January to October show production of diesel engines nationwide fell by 18.7 per cent from the similar period last year to 501,358 units (petrol engines during the same period gained 4.9 per cent to 2,616,224 engines), while value fell 9.1 per cent to ¥82.7bn (about \$224m).

In the previous year, the number of engines built reached a peak of 715,544, up 7 per cent from 1976. The value in 1977 had been up 8.3 per cent to a high of ¥112.92bn, according to the Internal Combustion Manufacturers' Association.

The biggest drag on the diesel industry domestically was agriculture, partly because the makers of such machinery overproduced last year and found themselves with large inventories.

PROFILE: KIRLOSKAR

Spreading its net

THERE IS no doubt that in parts of the diesel engine industry, especially in the lower horse power ranges, Japanese manufacturers have stolen the lead from the traditional home of the diesel engine, Western Europe. The two leading Japanese companies in the up to 30hp category, Yanmar and Kubota, have an annual production which is far above that achieved by the principal European producers; only Lombardini in Italy comes near to matching them. But will the Japanese be able to retain their lead? Is it possible that the mass production of small diesel engines will shift to developing countries as is already happening in some other branches of engineering?

Of course both Yanmar and Kubota have the advantage of a large internal requirement for diesel engines in their own tractors and construction equipment. Besides it would be wrong to regard even the small diesel engine as a low-technology product. But it is interesting that diesel engines represent one of the few branches of mechanical engineering where India has achieved a significant share of world production. India's production of engines is probably running between 400,000 and 500,000 units a year, about the same as Italy and well ahead of France; only Japan, the UK, West Germany and the U.S. are in front.

There is a huge domestic demand for diesel engines in India, especially for irrigation pumps and generator sets, but in other fields Indian manufacturers have not always been able to make use of this home base to develop a substantial export business. Here, however, one of India's largest private sector industrial groups, Kirloskar, has in the last few years become a force to be reckoned with in the world diesel engine industry.

Kirloskar Brothers, the first company in the group, was incorporated in 1926 and began with the manufacture of ploughs. As the industrialisation of India gathered pace, the Kirloskar group branched out into the manufacture of diesel engines, electric motors, machine tools, pumps and valves, tractors and a number of other products. Most of these involved the establishment of separate specialist companies. Thus the group now includes Mysore Kirloskar, one of the largest machine tool producers in India; Kirloskar Electric in Bangalore, which makes electric motors, transformers, variable-speed drives and other electrical equipment; and Bharat Forge, which makes heavy-duty crankshafts for engine manufacturers in India and abroad.

Kirloskar Oil Engines, incorporated in Poona in 1948, was the first Indian company to make high-speed vertical diesel

engines in water-cooled and air-cooled versions. It currently produces 37 models in the 3-240-hp range for industrial, agricultural and marine applications, and employs over 3,000. Another company in the group, Kirloskar Cummins, was set up in 1980 to make heavy-duty engines in the 60-1,600-hp range for construction equipment and other industrial and marine applications; these engines are identical in design with the American-built Cummins engines.

Producing some 100,000 diesel engines a year, Kirloskar ranks as one of the world's largest manufacturers of small engines. Like other Indian engineering companies, Kirloskar has exported its engines in considerable numbers to other developing countries, both directly in the form of loose engines and indirectly as part of such equipment as pump-sets. But in recent years the company has taken steps to strengthen its market position in the developed markets of Western Europe and North America.



Peter W. Schutz, aged 49, was appointed a member of the Board of Management of Kloetner-Humboldt-Deutz in April, 1978, with responsibility for engines and turbines. Born in Berlin, Schutz took a degree in mechanical engineering at Illinois Institute of Technology and began his career as an engineering trainee with Caterpillar. After working as a project engineer in the development of Caterpillar's truck diesel engines he joined Cummins Engine in 1967 as director of technical planning. In 1971 he was appointed vice-president with worldwide responsibility for product planning and in the following year he became vice-president, automotive marketing.

G.O.

Export

CONTINUED FROM PREVIOUS PAGE

Schutz "When and where has still to be settled." He points out that this year's sales volume in America will be not far short of 100 engines a day, which makes an economical basis for local production.

"We won't be making engines in the U.S. because of the dollar/Deutschmark exchange rate or because we can build them cheaper there, but because we can service our customers better," he says. Apart from existing and potential American customers, a good many European manufacturers who use Deutz engines in their equipment are now selling or intending to sell in the U.S.

Manufacture in the U.S. is as logical for Deutz as it was for Volkswagen, and perhaps even more necessary for marketing reasons. Like Volkswagen, Deutz has developed the market progressively over a number of years and the product is now well accepted. For reasons of speed, the company may acquire an existing American factory rather than build on a green-field site.

With the larger water-cooled engines, Schutz faces a different set of problems. Here all the leading manufacturers have been hard-hit by the slump in

shipbuilding. There have been strenuous efforts to find new markets in power generation and other industrial applications. Deutz whose range includes the 628 range producing 250 hp per cylinder and the 540 range providing 600 hp per cylinder, has fared "relatively well," according to Schutz.

A number of orders has been won for power stations, drilling rigs and other industrial uses. Having maintained production fairly constant in the last year or so, Schutz is now looking for some increase in volume.

It is, of course, an entirely different business from the mass-production, water-cooled engines, which are almost all sold to OEM customers for incorporation in their own equipment. Although there is some transfer of basic knowledge between the two businesses, they are run as distinct profit centres.

Covering such a wide horsepower range from 3 to nearly 10,000 hp, Deutz is in an excellent position to profit from the expected growth in worldwide usage of diesel engines. But the biggest opportunity—and the biggest test of Schutz's marketing strategy—will be in the U.S.

G.O.

Equipment

Kubota in the half year had a sales drop of 0.3 per cent to ¥232,519bn while net profit fell about 1.5 per cent to ¥9,292bn. The only sector in Kubota's diesel engine facilities doing relatively well was construction equipment, which increased 4.9 per cent from a year ago but which remains a comparatively small segment of overall business.

Yanmar Diesel in its latest annual report for the year ended March 31, 1978, showed a net profit drop of 30 per cent to ¥1,162bn, while sales gained 11 per cent to ¥161,150bn. The company expects that this year sales of agricultural related

machines with diesels will be down by 10 per cent, while marine related sales remain flat. Construction equipment sales are up by 25 per cent. Exports of land use engines (20 per cent of them diesel) were up about 23 per cent in the first seven months of 1978, but the industry is being told to avoid excessive increases in exports by the Minister of International Trade and Industry (MITI), which fears that a fast pick-up in engine exports to compensate for sluggishness at home could in the long run lead to further protectionist moves in other nations.

The Japanese market for imported diesel engines remains limited. Imports accounted for only 0.22 per cent of all the engines bought in Japan in 1977, down from 0.37 per cent in 1976 (in value terms the figures for imports are higher). The U.S. in 1977 exported 2,296 diesel engine products to Japan, valued at ¥2.3bn, down from 4,685 units valued at ¥2.42bn in 1976; the UK sold 2,065 diesel units in 1976 (¥1.074bn), down from 3,269 (¥1.443bn) in 1975.

West Germany, which exports mostly large-scale engines, has done better, expanding sales in Japan to 1,507 units for ¥1.5bn in 1977 from 1,263 units worth ¥866m in 1976.

Production of marine use diesel engines peaked in 1977, with orders now expected to turn downward as the worldwide depression in shipbuilding deepens. In Japan, demand for diesel engines for fishing vessels has also slipped as a result of the 200 mile fishing limits now in force in many countries, which has prompted fishing fleet cutbacks.

In the first six months of 1978, there were 7.3bn horse power in marine engines built, down 5.5 per cent from a year ago; tonnage was down 27.2 per cent to 87,508 tons and the value dropped 24.1 per cent to ¥131.9bn. Domestically, the shipbuilding industry is in the process of cutting back 35 per cent of capacity, with the biggest yards reducing by around 40 per cent.

Nilgata Engineering, in the half year to September, 1978, saw sales drop 10 per cent to ¥66.8bn, while net profit gained a slight 1.7 per cent to ¥1,628bn. Its production of marine diesel engines in the September half year totalled 340 units for 362,000 hp, well below the 1975 half year historical peak of 469 engines with 340,000 hp in total.

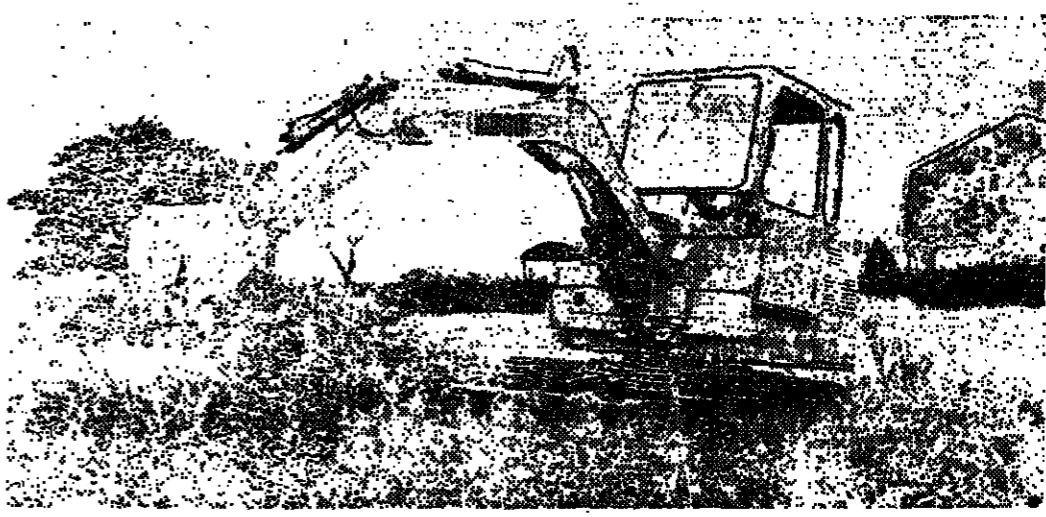
Sales of diesel engine passenger cars are beginning to soar because of their fuel economy, and improvements are being made in noise and vibration. Japan lags behind West Germany in the use of diesel engines in passenger cars but expects to catch up. In 1977, only 0.2 per cent of all Japanese cars were diesel compared with 3.7 per cent in West Germany, but two years earlier in Japan there were virtually none.

Not counting imports, mostly from Volkswagen, diesel engine car sales in the first 11 months of 1978 totalled 38,806 units, up about 47 per cent from an already impressive 26,436 units in 1977. In 1975 there were only 1,100 units and in 1976 fewer than 9,000.

Nissan Motor is the largest maker of diesel cars, with three models, the first of which was introduced in 1975. Toyota now has a diesel car and Isuzu, which makes large trucks with diesel engines, also entered the market in 1977.

The Japanese public is slowly awakening to the fact that in Japan the cost of operating a diesel car is about a third of that of a petrol-engine car. The major motor companies expect that they will reach the level of Mercedes-Benz—over 40 per cent—in the number of diesel cars produced compared with petrol-driven cars over the next few years.

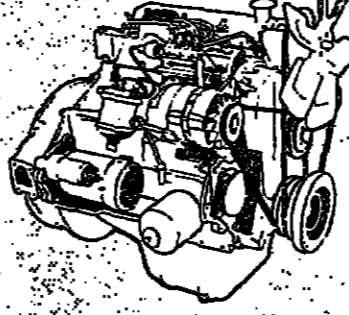
Richard C. Hanson



Kubota is one of Japan's largest producers of small diesel engines, which are used in its own tractors and construction equipment and for out side sale. Sales of Kubota's small ride-on tractors aimed at parks, sports grounds and similar applications are running at over 10,000 units a year in the U.S. and the market in Western Europe is also being developed. The picture above shows the Kubota KH10D, said to be the smallest 360-degree tracked excavator available in the UK. It is powered by an 18 horse power three-cylinder diesel engine. Other major manufacturers of small diesel engines include Yanmar, the biggest manufacturer, and Isaki. Japan is by far the largest producer of this type of engine.

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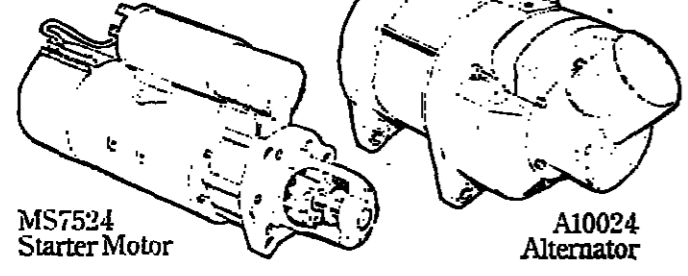


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PROFILE - CUMMINS

Plan to launch new series

CUMMINS, THE largest independent diesel engine manufacturer, is nearing the point of decision on the sourcing of a major new range of engines aimed initially at European truck manufacturers. It will be a 10-litre in-line engine in the 230-320 hp range designed to serve what Cummins describes as "the large volume, heavy-duty European truck market." This is the lower end of a market already served by Cummins' NH series of 14-litre in-line engines used by such manufacturers as Leyland, Ford, ERF, Foden and Seddon-Atkinson in trucks of 32 tonnes gross vehicle weight (GVW) and above. Below this size, but still in the heavy-duty category, there is a requirement for smaller in-line engines of a size and specification which the NH series is not quite able to match.

Most engines in this category are at present made in-house by the European truck manufacturers themselves. One of the keys to the success of the new project will be Cummins' ability to convince the truck makers that it makes more sense to buy their engines from an outside independent supplier. The argument—which is at the heart of the company's position in the automotive market—is that the independent supplier, selling to a number of different end-users and specialising in the engine business, is better able than the truck manufacturers to meet new requirements and to invest in advanced technology.

Clearly Cummins could embark on the new engine range with greater confidence if it secured an advance commitment from a substantial truck manufacturer to buy it. There has been speculation in the industry that Leyland Vehicles, the BL truck and bus subsidiary, might fulfil this role. It already offers Cummins NH engines in its top-of-the-line Marathon truck—but Leyland is only one of several potential customers for the new engine. Leyland is a substantial engine manufacturer in its own right, both for use in its own vehicles and for outside sale.

When and where the new engines will be manufactured has yet to be decided, but the expectation is that production will begin in the early 1980s. Meanwhile Cummins is pressing

ahead with expanding production of its existing families of engine and developing new markets for them.

Cummins is of course, an international company and the largest part of its business is still in the U.S. It supplies over 40 per cent of the diesel engines used in heavy-duty trucks; all the big truck makers, including General Motors, are among its customers. Cummins' biggest engine plant in Columbus, Indiana, is currently manufacturing about 450 NH engines a day. Both with the NH and with its other engine families Cummins is an important supplier to non-automotive markets, including construction, industrial and agricultural equipment, mining machinery, generating sets and marine applications.

Cummins has been manufacturing in Europe since 1956. The plant at Shotts, in Scotland was established to supply NH engines to Cummins' customers who were developing their European manufacturing operations. An important customer in the early years was the Euclid earthmoving equipment plant in Scotland; it is now Terex, owned by General Motors and mainly using engines made by Detroit Diesel, the GM subsidiary.

But Shotts' most important customers now are the truck manufacturers; about 60 per cent of Shotts' business is automotive. Apart from the truck makers, Cummins also supplies NH engines to construction equipment manufacturers such as Coles Cranes, Atlas Copco, CompAir, Ingersoll-Rand and Clark. A big expansion is under way at Shotts, which will double its manufacturing capacity by 1981.

Exclusive

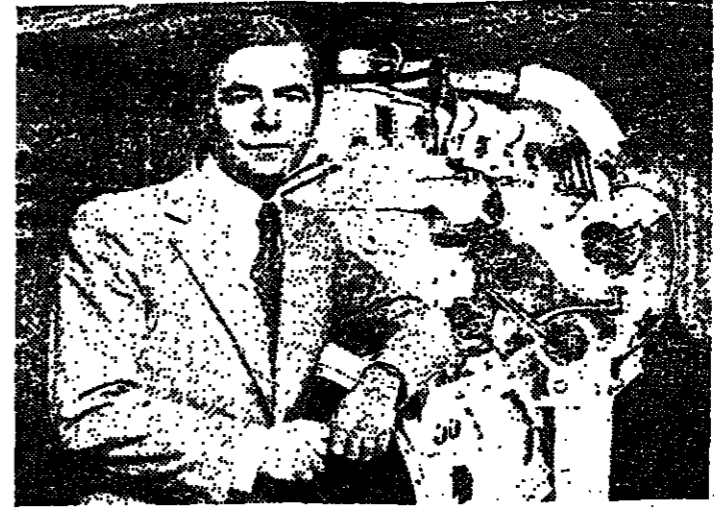
UK-based truck manufacturers have been important customers for Shotts, but Cummins made an important breakthrough in the Continental market when Ford chose the NH engine as the exclusive power unit for its new Transcontinental truck assembled in Amsterdam. Cummins is in continuous discussions with a number of Continental manufacturers and some new OEM (original equipment manufacturers) deals are possible in the near future.

Above the NH, Cummins has the K family of engines which go up to 1,600 hp and are used mainly in heavy construction equipment and large generator sets. The family includes the KV12 and KV16 which are manufactured only at Daventry; last year this factory, which was acquired by Cummins in late 1972, produced about 800 engines. More than half of Daventry's output is exported. Important OEM customers in the UK are the generator-set manufacturers, including Dale, Petbow, Industrial Engines and Dawson Keith.

Britain is also Cummins' sole worldwide source for the Small Vee engines, produced at Darlington at the rate of about 100 a day. These compact engines, covering the 150-240 hp range, have a wide variety of automotive and non-automotive applications. About 90 per cent of Darlington's production is exported.

An important customer in Britain is Ford, which uses the Small Vee engines as an option in its 1674 and 28-tonne trucks. In the U.S. Ford has recently started offering the Darlington-built VT-225, a 225 hp engine, in its 8000-L series trucks, marking an important breakthrough for Cummins in the medium-duty section of the U.S. truck market.

With an annual production worldwide of some 150,000 engines and engine kits Cummins has steadily built up its reputation as an independent producer of high-quality engines incorporating advanced technology. Although its Small Vee engines compete against engines made by Perkins, there is an important difference in the way the two companies approach the engine business. Whereas Cummins would not expect to produce any one family of engines at a rate of more than say, around 500 a day, Perkins is looking for volumes of around 1,000 a day. One of the



Mr. Joseph Patrick, vice-president UK and Europe, Cummins Engine

big questions for the future is how far the kind of technology associated with Cummins will move downwards into the sector of a market normally supplied by Perkins-type engines and what response to such a shift, if it takes place, Cummins should make.

This is a separate issue from the new 10-litre in-line series discussed at the beginning of this article. That engine would be very much in the mainstream

of Cummins' business; the desired production rate would probably be in the region of 300 a day, or 60-70,000 a year. It is quite a different proposition from the engine which Cummins' U.S. rival, Detroit Diesel Allison, is planning to manufacture this year—an 8-litre, 4-stroke, V8 engine designed for trucks in the 7-12 tonne GVW range. With this engine Detroit Diesel is aiming to capitalise

on the expected switch from petrol to diesel fuel in the Class 5 and Class 6 sectors of the U.S. market—a market which is attracting considerable interest from European truck manufacturers. Cummins must naturally be considering how it could participate in this new market, but it seems unlikely that it could contemplate a major entry into this business without an assured high-volume customer; Detroit Diesel has of course, such a captive customer within General Motors.

Danger

Cummins must also be conscious of the danger of spreading itself too thin over too wide a horse-power range. In the past few years the top management has made a firm decision to concentrate on the diesel engine business. A number of diversification ventures were sold off and the clear policy is to build on the company's reputation as a producer of high-quality engines, widening the market both geographically and in terms of applications. A move "down market" to attack a new big-volume business would only make sense if the engines required by that market were in line with Cummins' established design and manufacturing philosophy.

G.O.

CUMMINS' MAIN ENGINE PLANTS			
Plant	Model	HP range	Applications
Columbus, Indiana	NH	230-450	Trucks, industrial, marine
	V-902	240-500	Trucks, industrial, marine
	V-12	525-800	Generator sets, and mining
Charleston, S. Carolina	K6	450-600	Trucks, industrial, marine
	NH	230-450	Trucks, industrial, marine
Jamestown, NY	NH	230-450	Trucks, industrial, marine
Darlington, England	Small Vee	150-240	Trucks, buses, industrial, marine
Daventry, England	KV12, KV16	230-450	Trucks, industrial, marine
Shotts, Scotland	NH	800-1,600	Generator sets, industrial, marine

PROFILE - CATERPILLAR

Preparing for attack on European market

CATERPILLAR IS the world's largest manufacturer of earthmoving machinery; according to some estimates it has about half the market outside the Soviet Bloc and China. Its ability to expand its market share in North America is obviously limited by antitrust considerations, although its dominance of the industry has never been challenged by the antitrust authorities. More important, the growth in demand for construction equipment over the next few years is likely to be steady rather than dramatic. Partly for these reasons, Caterpillar has been devoting a large part of its capital investment in the past few years to the diesel engine business. It is already an established supplier of engines to the heavy truck makers in the U.S.; it has a strong position in marine and industrial markets, and in power generation. Caterpillar is now determined to win a similar market position in Europe.

Caterpillar produced its first diesel-powered crawler tractor in 1931. Even in those early days it supplied engines to other original equipment manufacturers and for irrigation purposes. During the 1950s new versions of Caterpillar engines were designed for marine applications and for generating sets; a separate engine division was created. In the past decade there has been a determined effort to upgrade the importance within the company of non-captive engine sales, with new manufacturing facilities, new engine designs and new marketing arrangements.

Doubled

The Mossville engine plant in Illinois, which is the only source of Caterpillar engines for machines other than the company's own equipment, has been doubled in size. Recently a new site has been acquired at Lafayette, Indiana, which is believed to be destined either for diesel engine production or for diesel components. Caterpillar's total commitment to diesel engines between 1974 and 1978 is thought to have been nearly \$1bn.

After some years of developing engines specifically for automotive applications Caterpillar achieved a breakthrough in 1969 when its 1100 series of 8-cylinder diesels was chosen by Ford to power all its mid-range (diesel) trucks. This was followed by the 3100 series and later the 3300 series. Caterpillar now supplies engines to most of the leading U.S. heavy truck producers, including General Motors, International Harvester



The South Shields pilot boat powered by a Caterpillar Marine Engine

Mack and White. More than 25 per cent of Caterpillar's design and engineering budget is spent on engines.

For the past decade Caterpillar's engine sales have been growing appreciably faster than the rest of its business. In 1977 sales of diesel engines and related parts (excluding the engines used in Caterpillar's own machines) amounted to \$771m, representing about 13 per cent of the company's total sales of \$5.5bn. The base volume provided by the company's in-house requirements, together with its heavy investment in advanced machine tools and automated equipment, should make Caterpillar one of the lowest cost diesel engine suppliers in its size range. There has been speculation that the company might one day decide to enter the truck market directly, but it seems more likely that Caterpillar, like Cummins, will see better growth prospects as an independent engine supplier.

Caterpillar now offers five basic families of diesel engine in 321 different configurations. Apart from the truck market the company is a major supplier of engines for use in drilling rigs and other petroleum-related applications. It has a substantial share of the marine market, notably fishing boats; the expansion of several countries' fishing

fleets as a result of the extension of territorial fishing limits to 200 miles has brought a useful increase to Caterpillar's order book. Unlike some other engine manufacturers Caterpillar designs and builds its own generating sets which it sells under its own brand name.

In the earthmoving industry Caterpillar has always been known for product quality and for service support through strong, well-financed dealers. The aim is to extend this reputation to diesel engine purchasers for whom reliability and service are the primary requirements but who may never have dealt with Caterpillar before.

In Europe Caterpillar has done well in the marine business, particularly in Holland and Norway, and it has supplied more engines for North Sea applications than any other manufacturer. But the company is now preparing itself for a more determined attack on other sectors of the European market, particularly the automotive business.

A new engine-marketing division has been created at the Geneva headquarters of Caterpillar Overseas (which looks after Africa and the Middle East as well as Europe) and this group is working closely with Caterpillar dealers to develop

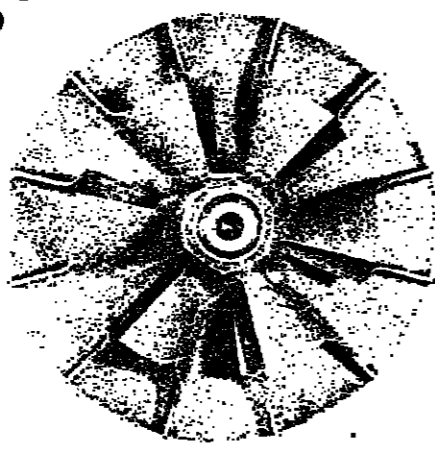
new business. Most dealers, like Leverton in the UK, have formed a separate sales team for engines. Larger OEM accounts are handled directly by Caterpillar Overseas in Geneva; these include Aveling Barford, which fits Cat engines in some of its larger machines, and DJB Engineering, the manufacturer of off-highway dump trucks.

Clearly the volume market for the kind of engines Caterpillar makes is the truck industry, but here the company is up against established European competition—most of the European truck companies make their own diesel engines—and against an American rival, Cummins, which has been manufacturing engines in Europe for a good many years. Although Caterpillar does make engines in Europe (Glasgow is one such location), these are for use in the company's own European-built equipment and they could not be adapted to supply the European truck industry.

Caterpillar may eventually need to set up its own manufacturing plant in Europe for non-captive engines. But the first step is to find the customer who will provide the launching platform into the volume market—the role played by Ford in the U.S. 10 years ago.

G.O.

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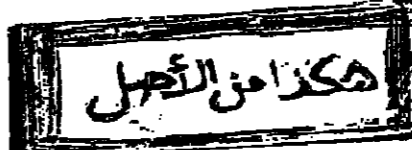
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PROFILE—GEC DIESELS

Traditional emphasis on quality

EVERYONE KNOWS that Sir Arnold Weinstein, managing director of GEC, has a very small head office at Stanhope Gate in London and pushes as much authority as possible down to the men who run the operating groups. What is not so well known is that the same principle of decentralisation is followed: no less vigorously within the groups themselves.

Thus David Powell, managing director of GEC Diesels, is essentially a co-ordinator of six highly autonomous companies, four in the UK, one in France and one in the U.S. Each of these companies is responsible for designing, selling and making its products. The only central department is marketing, and this is very much a staff function—advising on the appointment of distributors and

monitoring their performance, supplying market intelligence to the companies, but very little concerned with selling.

Does this mean that opportunities for rationalisation and economies of scale are being neglected? Each of the four UK companies—Ruston in Newton-le-Willows, Dorman in Stafford, Paxman in Colchester and Kelvin in Glasgow—is a specialist engine builder; they are not in the mass-production business. At the top end Ruston makes around 200-250 engines a year; at the other end of the scale, Dorman, which comes nearest to the volume market, makes about 6,000 a year. (By contrast, Perkins, making engines for tractors, trucks and other high-volume applications, makes some 230,000 a year in the UK.)

There is virtually no scope for standardisation of components between the four companies. It is hard enough to get standardisation between, say, the three main engine types produced by Ruston: key components like the crankshaft have to be different to suit each engine's particular specification.

This does not mean that the companies do not help each other on manufacturing and design matters. For example, a crankcase machining facility at Paxman was made large enough so that it could cope, if necessary, with the lower end of the Ruston range and the top end of the Dorman range. GEC Diesels has its own forge and foundry which can supply all the companies, though they are not compelled to buy inhouse.

The chief engineers at the four UK companies meet every month to pool ideas and Powell himself, advised by Dr. R. V. Hughes, technical director of Paxman, keeps an eye on new engine developments throughout the group. There is a tendency for the number of distinct engine types to diminish over time—there are now about 24 within GEC Diesels—but the process has to be gradual. The nature of this industry is that once an engine establishes a reputation for quality and reliability with a particular set of customers—whether they are fishing boat builders (Kelvin) or manufacturers of heavy earthmoving equipment (Dorman)—it lasts for a very long time. So even when there are two competing engines in the group Powell

cannot afford to knock one of them out too precipitately; it has to be allowed to fade away.

On the selling side Powell has considered from time to time the establishment of a single export organisation, but he has rejected it on the grounds that the management of the operating companies need to be directly responsible for, and in close touch with, their overseas business. There are a good many overseas distributors who handle some or all the engines in the GEC range, but an individual company in the group is not forced to use the common distributor if there are good arguments against it.

The four UK companies came into the GEC after the merger with English Electric in 1968. A good deal of reorganisation was necessary in the early years, but

by 1972, when the group was beginning to earn satisfactory profits, the decision was taken to expand internationally. The four companies had a sizeable export trade—at present about 35 per cent of GEC Diesels' UK production is exported (the proportion rises to 75 per cent if indirect exports are included)—but they were under-represented in two of the most important markets, Continental Europe and the U.S.

On the Continent a number of take-over possibilities were examined, including companies making small engines below the Dorman size range and some making very large engines above Ruston; an important proviso was that any bid should be agreed. Finally, GEC settled on Baudouin in Marseilles, a well-established supplier of engines for marine and other applications. The integration of Baudouin into GEC Diesels has been a gradual operation—the Dorman Q engine is now being manufactured in Marseilles—and the acquisition has not had a dramatic impact on the level of GEC engine sales in France. But the presence of a French manufacturing company within the group has increased the awareness of the French market among the UK companies and more business on the Continent has been won.

GEC DIESELS		
Company	Horsepower range	Main applications
RUSTON	490-5,000	Marine propulsion, power generation.
PAXMAN	375-4,500	Marine propulsion, power generation, rail traction, small boat propulsion.
KELVIN	50-700	
DORMAN	30-800	Power generation, marine propulsion, industrial equipment, Marine, industrial.
BAUDOIN	50-1,500	
ALCO	700-4,500	Rail traction, marine, industrial.

Above 34 per cent of GEC Diesels' production goes to marine applications; 54 per cent for power generation and industrial applications, 12 per cent for rail traction.

PROFILE—HAWKER SIDDELEY

Group's move to expand share of the world market

AS PART of its diversification away from aerospace, Hawker Siddeley built up a substantial stake in diesel engine manufacture. With the aerospace interests now removed by nationalisation, the importance of the diesel engine business for Hawker Siddeley has become even greater: the existing subsidiaries in this field are being expanded and further acquisitions, especially outside the UK, are obviously a possibility.

The purchase of the Brush Group in 1957 brought with it Petters, one of the country's largest producers of small engines below 50 horse power, and Mirreles, a leading producer of large medium-speed engines for marine and industrial applications.

Both companies design and manufacture equipment incorporating their own diesel engines. In addition to generating sets, Petters has built up a sizeable business in transport refrigeration units for road, rail and sea applications. The two companies supply engines to a wide range of OEM customers, particularly in construction equipment. Thwaites, the manufacturer of small dumpers, is one important customer for Lister engines.

At the other end of the horsepower range, the two Mirreles Blackstone companies have inevitably been affected by the shipbuilding recession. There is intense competition among manufacturers of medium-speed marine engines—the largest share of the market is held by Piastick and its licensees—and they have all sought to expand their business in stationary applications, for power generation.

HAWKER SIDDELEY'S U.K. DIESEL ENGINE COMPANIES		
Company	HP range	Application
Mirreles Blackstone (Stockport)	1,500-11,000	Marine, power generation, industrial
Mirreles Blackstone (Stafford)	180-2,500	Marine, power generation, industrial
Petters	10-32	Marine, power generation, industrial
Lister	3-250	Marine, industrial, power generation
Gardner	188-250	Automotive, industrial, marine

capacity is about 6,000 engines a year.

There may well be greater investment in modern machine tools, particularly in the early stages of machining, without undermining the Gardner traditions of craftsmanship. Internationally, too, Gardner should benefit from its association with Hawker Siddeley, particularly in the marine field.

As with other engine manufacturers, Hawker Siddeley's ability to expand its share of the world market depends in large part on the strength of its sales

and service organisation. In the U.S., Witte Corporation of Kansas, a manufacturer and distributor of diesel engines, was acquired in 1974; it handles Lister products and has been renamed Lister Diesels Inc.

In 1975, Hawker Siddeley acquired a 37 per cent interest in Onan Corporation, which has a sales and licensing agreement with Petters. Apart from its production of petrol and diesel engines, Onan is one of the leading U.S. manufacturers of generating sets, with a marketing network which should prove of great value to Hawker Siddeley.

On the Continent, Lister last year established a new subsidiary in Germany. One of the main objectives is to sell engines to original equipment manufacturers, especially in the pump and construction equipment sectors. The aim is to convince German manufacturers that by using Lister engines, backed by its worldwide service network, they are more likely to secure export business.



Mr. David Powell, Managing Director, GEC Diesels enabled GEC Diesels to get its American operation moving much faster than would have been possible on the basis of direct exports from Britain.

Other acquisitions are possible, but it seems unlikely that GEC will wish to depart from its traditional emphasis on premium quality. Thus Dorman is moving cautiously into the automotive market—one of its engines is being offered as an option by ERF—and this is clearly a sector which, though crowded, offers scope for expansion. But for the present GEC is content to build slowly on Dorman's established experience as a supplier of engines for off-highway vehicles. "We are not going into the truck market in a bang fashion," says Powell. In the diesel engine business, where mutual trust between customer and supplier takes a long time to establish, new markets are not won in a hurry.

In 1965, Hawker Siddeley acquired R. A. Lister which included two diesel engine producers—Lister itself making small engines but covering a wider horsepower range than Petters, and Blackstone which made engines comparable to those of Mirreles.

In 1977, the group made its move into the highly competitive automotive market by buying L. Gardner, the specialist engine producer, which, though a small volume manufacturer with a very distinct image, is in direct competition with such companies as Cummins, Leyland and Rolls-Royce Motors.

Thus, Hawker now has a broad range of diesel engines in its portfolio. Like GEC, the parent group gives each company a high degree of autonomy; they are run as separate businesses and compete with each other in certain markets. Lister and Petters, for example, both make their own generating sets which are sold in competition.

Although Mirreles and Blackstone were merged after the 1965 acquisition of Lister, they have recently been separated out as Mirreles Blackstone (Stockport) and Mirreles Blackstone (Stafford); each company has a distinct product range and each is responsible for designing, making and selling their own engines.

Similarly, Gardner has retained its autonomy within the Hawker Siddeley Group. All five companies benefit from the overseas co-ordinating role played by Hawker Siddeley International.

In competitive terms, both Lister and Petters probably rank among the top ten producers in the world of small diesel engines. Their combined output is well over 100,000 engines a year, and more than half their production is exported.

Yet Hawker's most intriguing move in the diesel engine industry was the acquisition of Gardner. This company had been the subject of apparently unwelcome attentions from other companies, including its

Overcapacity among producers of large marine engines is likely to persist for several years. There is some concern among Britain's private sector medium-speed engine producers that the future policies of British Shipbuilders could make the situation worse. The danger is that British Shipbuilders may seek to bring work to its own engine subsidiaries by taking licences from foreign medium-speed engine producers, thus depriving companies like Mirreles Blackstone and Ruston, part of GEC Diesels, of potential orders.

Yet Hawker's most intriguing move in the diesel engine industry was the acquisition of Gardner. This company had been the subject of apparently unwelcome attentions from other companies, including its

All suppliers of diesel engines and generating sets have been affected by recent political and financial problems in Nigeria, Iraq and Iran, but this is regarded as a temporary hiccup in what should remain a growth market. The world's short of electrical power and those diesel engine manufacturers who are established in this field, like Mirreles Blackstone, are well-placed to take advantage of it.

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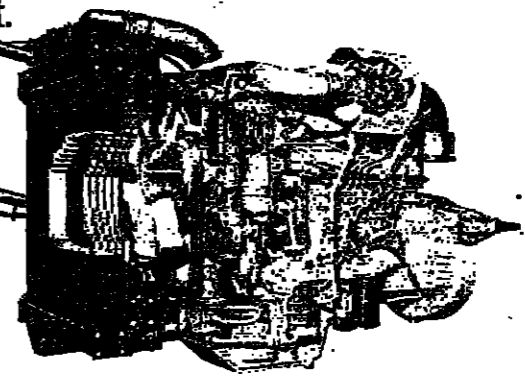
Yet Hawker's most intriguing move in the diesel engine industry was the acquisition of Gardner. This company had been the subject of apparently unwelcome attentions from other companies, including its

Within the Barton Hall engine works at Eccles, near Manchester, which includes a recently modernised aluminium foundry, the approach to engine manufacture is more akin to a craft than to the high-volume automated methods normally associated with the motor industry. The final stages of assembling the engine are entrusted to an individual craftsman who has personal responsibility for the quality of the product.

Hawker Siddeley is most unlikely to make drastic changes in the way Gardner conducts its affairs. Yet there would be little point in the merger unless Gardner was encouraged to grow somewhat faster within Hawker Siddeley than it would have done outside it; present

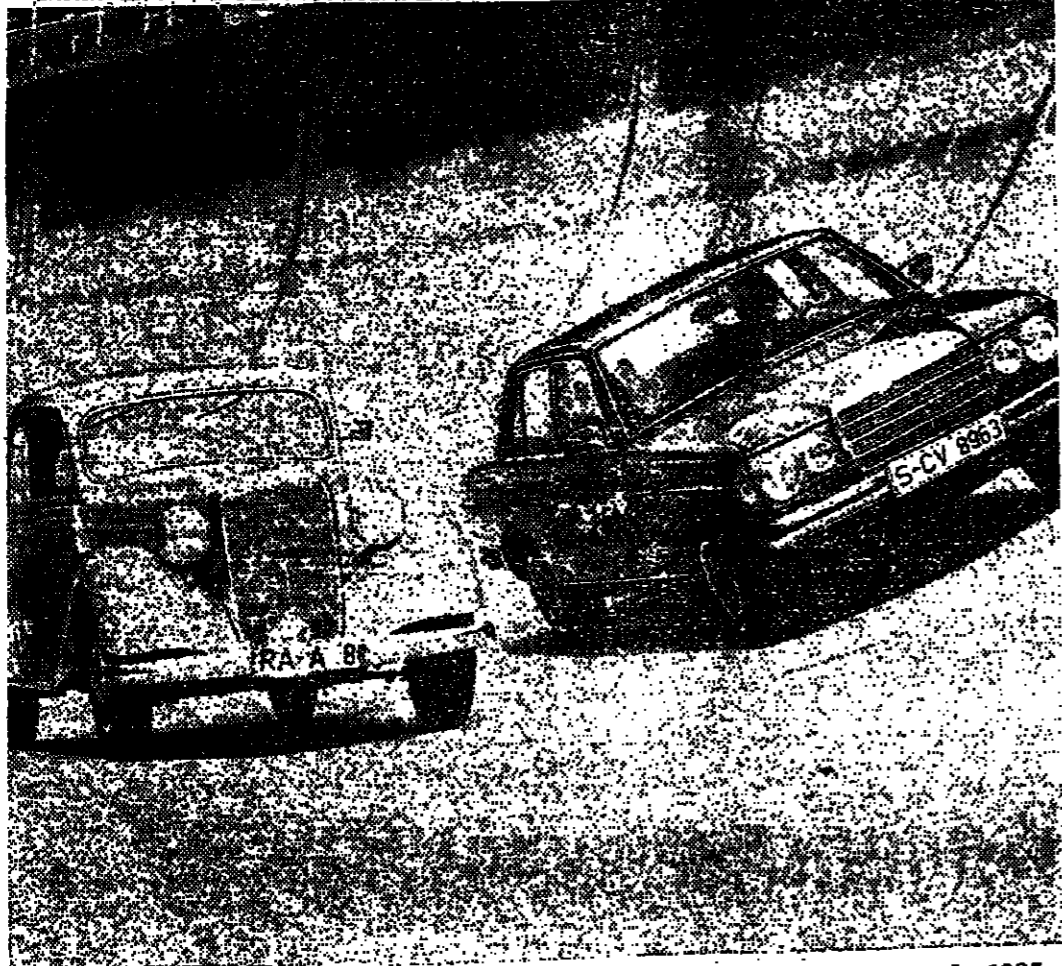
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Mercedes Benz has played a major part in developing the diesel for cars. In 1935 the 260D (left) was the first ever standard production diesel saloon and (right) is the 300D, which is the first car to be fitted with a five-cylinder diesel engine

DIESEL ENGINES XIV

Entering the U.S. battleground

WHAT IS the right strategy for participating in the American diesel market? That question has been pre-occupying European and Japanese manufacturers of engines, engine components and products incorporating diesel engines. While demand for diesel engines in the U.S. seems certain to grow considerably faster in the next decade than it has in the past, rates of growth will vary from one sector of the market to another. The prospective foreign supplier has to weigh up the likely acceptability of his particular type of engine as well as the financial risk of a large-scale commitment to the U.S. There is the further uncertainty about the impact of Federal regulations on the industry.

At the risk of over-simplification, there appears to be a choice between five broad strategies, though they are not mutually exclusive. These are:

1. The establishment of manufacturing facilities in the U.S.
2. The acquisition of an established U.S. diesel engine manufacturer.
3. The establishment of a wholly-owned sales company in the U.S.
4. The negotiation of supply arrangements with an American original equipment manufacturer (OEM), who will install in his equipment engines shipped from Japan or Europe.
5. The sale in the U.S. of diesel-powered equipment made in Europe or Japan.

1. **Local manufacture**
Perkins, the Massey-Ferguson subsidiary which is Europe's largest manufacturer of diesel engines, acquired a factory in Canton, Ohio, from White Motor. Production of diesel engines at this facility is running at about 22,000 engine units a year and the intention is to increase the output to 100,000 engines a year by the early 1980s. Current customers for the Canton-built engines include Massey-Ferguson itself and a number of other OEMs.

One of Perkins' main European rivals, Deutz of Germany, has decided to manufacture engines in the U.S. in the future, though the location and timing have yet to be announced. Deutz expects to sell some 20,000 German-built engines in the U.S. this year but it needs a local manufacturing base in order to forge closer links with its American customers.

2. **Acquisitions**
A quicker route into the market, especially for a company whose products are not well known and which does not already have close connections with particular customers, is the acquisition of an established company. It provides a ready-made marketing organisation and manufacturing facilities which can be used to assemble or manufacture those foreign-designed engines that seem most suited to the American market.

General Electric Company, one of the leading diesel engine builders in the UK, bought Alco from White Motor in 1977. More than 11,000 Alco engines are in service and the company's present production rate is about 150,000 engines a year; although best known for its rail traction engines, Alco also supplies the marine, off-highway, power generation and other industrial markets. Ownership of Alco gives GEC Diesel's direct experience of marketing techniques and customer requirements in the U.S. and provides vital support as the company seeks to develop sales of its British engines.

3. **Sales companies**
Lombardini, the leading Italian producer of small diesel engines, has set up its own subsidiary company based at Doraville, Georgia, which will establish a sales and distribution network throughout the country. The company will stock engines and parts and will be available for applications engineering and service training support. Lombardini also has its own subsidiaries in Germany, France, Spain and Singapore.

MTU (Motoren-und Turbinen Union Friedrichshafen), a leading German producer of engines in the 400-700 hp category, has established its own sales subsidiary at Houston, Texas. "The number of diesel engines

demanding product support in the U.S. and the inevitable setting-up of a local product-oriented dealer organisation induced MTU Friedrichshafen to establish its own American marketing and service base."

Kirloskar, the Indian company, has set up its own company in Baltimore, Maryland, and is developing a nation-wide sales and service organisation to support its range of 5-107 hp models.

4. **Supply arrangements**
Whether through direct exports or through local manufacture, the key to success in the U.S. diesel market is the OEM business—negotiating supply arrangements with a large volume producer of diesel-powered equipment.

There is some anxiety in Europe that Japan may seize a large proportion of this business, especially in the automotive sector. Nissan is supplying its diesel

engine to International Harvester for incorporation in the Scout cross-country vehicle. Mitsubishi is supplying diesel engines for Chrysler's light truck production and there have been reports that Ford is discussing with Toyo Kogyo and Isuzu the possible supply of diesel engines from Japan.

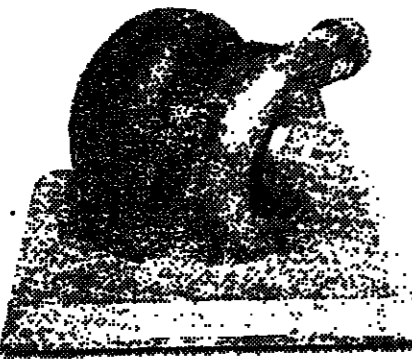
5. **Supply of original equipment**
Renault Industrial Vehicles, Iveco, Volvo and Daimler-Benz are exporting diesel-powered trucks to the U.S. Some other European truck makers believe that the scope for direct exports of fully built-up trucks is limited and that it will be necessary for the vehicles to be wholly or partially manufactured in the U.S. This is the thinking behind the purchase by White of a minority interest in White Motor, one of the smaller U.S. heavy truck producers; this may lead to the manufacture of German-designed trucks, incorporating some German-made components (perhaps including the engine), in an American factory.

Renault's French-built trucks are to be sold through the Mack dealer organisation and under the Mack brand name. A similar approach is being followed by some Japanese equipment suppliers. For example, Isuzu, one of the largest Japanese producers of tractors, has signed a long-term agreement with White whereby Japanese-built small tractors will be sold through White's network of farm machinery dealers.

Whatever marketing channels are used, sales of imported equipment incorporating diesel engines are certain to grow. This will bring opportunities for the engine suppliers and make it more necessary for them to have their own plants in the U.S.

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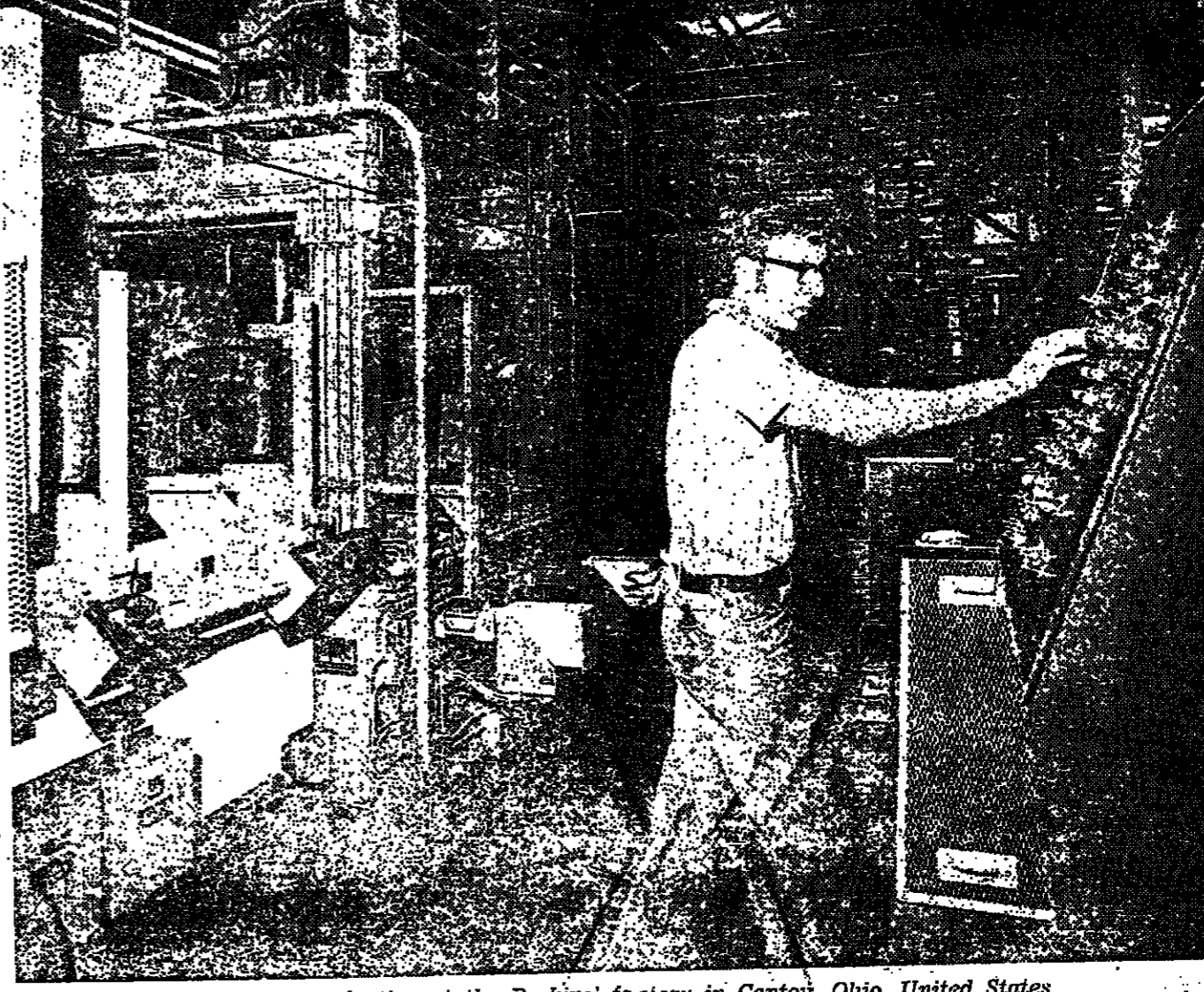
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Expanded

Among component manufacturers Robert Bosch of Germany, one of the two leading producers of fuel injection equipment, built its first American factory at Charleston, South Carolina in 1973. This plant will be expanded step-by-step in line with demands from the original equipment manufacturers. An important customer for Bosch will be Volkswagen, which will be manufacturing its diesel version of the Golf in the U.S. later this year. Other customers include John Deere, Mack and Detroit Diesel, the General Motors subsidiary.

Bosch's great rival in the fuel injection business, Lucas Industries of the UK, announced in 1977 that its CAV subsidiary would begin assembling fuel injection pumps at a new factory at Greenville, South Carolina. Lucas was already supplying some U.S. engine builders and Perkins is also an important customer for the new plant.

In making the announcement about the U.S. venture Lucas said the facilities in Greenville



Engine production at the Perkins' factory in Canton, Ohio, United States

Americans expect a compromise

DIESEL IS rapidly attaining the status of a "buzz word" in the U.S., largely because the fuel saving qualities of the diesel engine have given it an important role in the future plans of the Detroit motor industry. Although the Government's exhaust emission regulations seem to present a barrier to the widespread use of diesel engines in passenger cars of the 1980s, the car companies are going ahead on the assumption that a compromise will be reached.

And not just the car companies. Major European component suppliers such as West Germany's Robert Bosch and Britain's Lucas Industries are setting up assembly operations in the U.S. in the hope of a rapidly expanding market for fuel injection equipment. But the growth will come from trucks as well as cars. The class eight heavy duty market for trucks of over 33,000 lb has increasingly been dependent on diesel engines so that more than

85 per cent of this category is now diesel-driven. But the diesel engine is now rapidly trucking down into the medium duty category of classes six and seven. In the first nine months of this year diesel took 63.4 per cent of class seven shipments compared with 58.3 per cent in 1977, while in the larger class six segment penetration is climbing from last year's 8 per cent to more than 11 per cent. International Harvester is predicting that diesel trucks will

	1974	1975	1976	1977
Cummins	40.1%	37.1%	49.3%	47.2%
Detroit Diesel Allison	34.9%	24.7%	19.4%	22.6%
Mack	15.6%	22.4%	17.3%	16.3%
Caterpillar	8.5%	13.9%	11.3%	11.1%
Others	0.9%	1.9%	2.7%	2.8%

Source: Cummins Engines.

breakthrough into U.S. produced cars occurred last year when GM offered a diesel with some of its Oldsmobile models. Having sold 33,826 diesel-powered Oldsmobiles in the 1978 model year ending in September GM has scheduled production of 190,000 diesel-engined units for the 1979 model year which will be installed not only in Oldsmobile models but also in Cadillacs. The company is anxious to establish a market for diesel-powered cars as quickly as it can for their lower fuel consumption offers significant help in meeting the Government's fuel requirements which demand that the fleet cars sold by each car manufacturer conforms with a steadily rising scale of fuel economy.

The 1979 average is 19 miles to the gallon rising to 27.5 mpg in 1985, and GM's president, Elliot M. Estes, predicted only a few weeks ago that fully 35 to 30 per cent of his company's passenger cars will be equipped with diesel engines by then. Mr. Estes argues that diesels are essential if the large six-passenger U.S. car is to survive, but at the moment the extensive use of diesel power is threatened by the rule setting a 1.0 gram oxide of nitrogen emission standard for 1981. Quite simply neither GM nor anybody else has been able to design an engine able to meet that standard and it looks certain that Detroit will be petitioning for a waiver allowing a standard of 1.5 grams of NOX for up to four years. The manufacturer will have to show that there is no health risk resulting from a relaxation of the rule and the Environmental Protection Agency has issued guidelines on the health data required which the industry regards as extremely stiff.

A relaxation of the standards is by no means assured and the industry may well have to lobby Congress for relief. In the meantime, there are reliable reports that GM is pressing ahead with plans to produce at least two and possibly four new diesel engines within the next three years. Firm plans apparently include a 5-litre V8 at Chevrolet in 1981 and a 3.8-litre V6 at Buick for 1982. At the same time GM is said to be also considering designs for a 4.1-litre diesel V8 from Cadillac and a 1.8-litre four-cylinder diesel from Chevrolet.

These would supplement the Oldsmobile output which is GM's only current source of light duty diesels—5.7-litre V8 and 4.3-litre V8. Both of these are adaptations of gasoline engines but the 5-litre Chevrolet is said to be a brand-new design which will be installed on the division's 1981 pickup trucks.

But these interesting and important developments in private cars should not be allowed to obscure the fact that in unit terms the so-called industrial market is still the largest. Here the diesel engine of 50 hp and upwards is the workhorse in industries as diverse as agriculture and mining. Hard data on the market are much more difficult to obtain, but Cummins Engines, one of the world's leading manufacturers of diesel plant, estimates that in 1978 the industrial market for diesel engines totalled around 389,000 units, which divided as follows: generator sets 19,000, agriculture 216,000, off-highway vehicles 117,000, stationary power 31,000 and marine 6,000. In the past two years the market is said to have shown only modest growth with off-highway and marine sales rising by about 5 per cent and agriculture remaining static.



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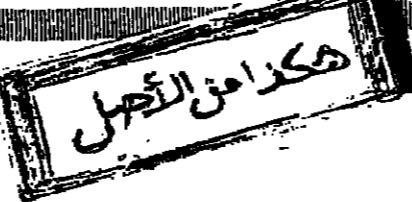
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Year	Sales
1970	103,714
1971	113,152
1972	143,089
1973	168,389
1974	167,259
1975	192,508
1976	129,076
1977	188,297

Source: Automotive News 1978 Market Data Book.



John Wyles

DIESEL ENGINES XVI

The scope for further development

THE DIESEL engine boasts a long and distinguished career as a power plant. Engines are in use covering the range from under 5 hp to 50,000 hp — a much wider spread than that in any other type of prime mover.

It has attained this pre-eminence thanks to a low fuel consumption, which is superior to that of its competitors in almost all fields, and to a well-deserved reputation for reliability and durability attributable in part to the absence of electric ignition.

The specific power output of diesel engines has gradually increased over the years, both by increasing speed and by increasing levels of supercharging. The increase in supercharging is likely to continue, involving a wider use of two-stage turbocharging for the larger engines. We are also likely to see a much wider use of turbocharging for small high-speed diesel engines.

Questions

Consideration of future trends in the technical development of the diesel engine and in the expansion of its markets raises a number of important questions.

1. What scope is there for further development of the diesel engine?

The high-speed, light duty category of diesel engines — those used for passenger cars, taxis, and delivery vans — employ indirect injection combustion systems where the fuel is injected into part of the compressed air charge in a pre-or swirl chamber which is separated from the remainder of the air charge by a small passage or throat. If direct injection, as used in most other diesel engines, were possible it would give better cold starting, lower heat losses and an 8 per cent, to 10 per cent improvement in fuel economy.

The problems of employing direct injection arise mainly from the wide speed range of such engines. These problems have proved intractable in the past, and while there is no guarantee that practical solutions will be found, a number of possible approaches are at present under study which could lead to the introduction of direct injection over the next five to 10 years.

On the heavy duty truck and larger range employing direct injection, while the engine has an essentially good fuel eco-

nomy, even the best only converts about 40 per cent of the heat energy of the fuel into useful work. The remainder of the energy is lost to the atmosphere, either directly in the exhaust or indirectly via the cooling medium.

There is currently a considerable interest in the use of insulating materials, which may be ceramic or metallic, to reduce the heat loss to the coolant. In an engine with a simple working cycle, either naturally aspirated or turbocharged, with a high load factor, the gains in fuel economy which could arise if these efforts were successful could be of the order of 8 per cent.

If an engine with a compound working cycle were used, however, the gain in economy at high engine load would be much greater—approaching 20 per cent. In such a cycle the exhaust gas driven turbine and the supercharging air compressor are both geared in with the engine so that any surplus power from the turbine, above that necessary to drive the compressor, is available as shaft power from the power unit.

It is also possible to consider the addition of a Rankine bottoming cycle, either to a simple turbocharged engine or to a compound engine. Such a cycle is identical to that of a steam engine but employs an organic fluid rather than water as the working fluid. It takes in heat from the exhaust gas and turns a portion of it into useful work.

In this way a further improvement in efficiency is possible, giving a total gain of 30 per cent or so at high power, but at the expense of greatly increased complexity, since an evaporator (boiler) is required together with a feed pump, an expansion turbine or reciprocator to develop the power, and a condenser to reject the waste heat. Since almost all the waste heat from the power plant is ejected into the atmosphere via the radiator and the condenser, they tend to be very bulky, and to require large cooling fans, and to require large cooling fans.

2. Will the present advantage of fuel consumption, reliability, and durability be maintained or will developments in competitors offset these advantages? Are new engines likely to arise which will have important advantages in these or other respects?

The competitors which the diesel engine will have to face

Engine type	HP range
Small industrial	2.5-40
Passenger car, taxi light van	40-100
Truck, bus and off-highway	100-1,500
Locomotive and industrial	1,000-5,000
Medium-speed industrial and marine	5,000-10,000
Low-speed marine and generating	8,000-40,000

FUTURE TRENDS

Trend over next 20 years. Currently in widespread use except in U.S. Much wider use likely there, but first cost is a problem. Currently widely used for taxi and light van operation apart from U.S. To meet fuel economy legislation the diesel could capture up to 25 per cent of total market if not barred by exhaust emissions legislation. Universally used now and will remain so. Currently universally used apart from markets where low weight is important—eg, gas turbines on oil platforms. Usage pattern will continue. Diesel/steam turbine mix. Not likely to change. Diesels will have longer stroke and lower speed to take advantage of improved propeller efficiency.

Major competitor. High compression ratio petrol engine. High compression ratio petrol engine. Stratified charge engine. Possible small use of gas turbines for luxury bus and coach, and Stirling engine for low noise city bus. Wider use of electrification on densely used railway lines. Wider use of electric power because of pressure on liquid fuel supplies. Steam turbine if residual fuel quality becomes very bad.

over the period until the turn of the century are:

(a) In the smaller sizes and especially in the small industrial and passenger car field, further development in the spark-ignited petrol engine, including stratified charge engines in which the fuel is not mixed uniformly with the air charge in the cylinder when combustion starts.

(b) Gas Turbines.

(c) Stirling engines.

(d) Electric power generated from nuclear or fossil fuels including vehicles operating with batteries charged during off-peak periods. A breakthrough in battery technology is necessary to give adequate range for most vehicle applications.

(e) Steam turbines. Really only in competition for the very highest powers in power generation and marine applications. The most promising way of increasing petrol engine fuel economy is by the use of higher compression ratios. A considerable amount of work is currently going on in this area, which is characterised by the prevention of detonation by the use of high turbulence levels to speed up combustion and/or by ignition timing retard, and by the use of weak fuel/air mixture strengths when approaching full throttle operation. The use of engine sensors and microprocessors may be necessary for successful service operation. The resulting improvements

in fuel economy can be quite striking. Data from Saab-Scania using 11:1 compression ratio showed a fuel consumption improvement of 9 per cent over the standard U.S. test cycle, while Ricardo test data on a car prepared by the Swiss engineer Michael May, using 5.8:1 compression ratio showed 15 per cent improvement over the standard ECE cycle. Provided the necessary high octane petrol (97-98 RON) is available, high compression ratio petrol engines could approach current light duty diesel engines in fuel economy in typical city operations.

Stratified charge engines occupy an intermediate position between spark-ignited petrol engines and diesel engines. Ignition is by means of a spark, but the fuel/air charge is not uniformly mixed during combustion. Many variants are possible, but while the fuel consumption of most of these is not as good as that of a straight diesel engine, there is an interest in the U.S. in employing the Ford Proco system in the larger cars, and the late injection types, such as the Texaco-TCCS and the MAN FM, have abilities of running on fuels with rather good octane properties. These fuels which are typical of the so called wide-cut fuels which may be obtained more efficiently from petroleum crudes in the future than are

current diesel fuels and petrols, or may be obtained from coal, could be important in the longer term.

The use of gas turbines for a wider range of duties than seen in their current pre-eminence in civil aviation and in peak looting and stand-by service in power generation has been forecast for many years. Major problems still exist, however, and to compete with the diesel engine, breakthroughs are required in the following areas:—

Efficiency. Temperature limitations of materials have restricted and still restrict the efficiency to below that of the diesel engine.

Durability. In order to achieve any reasonable efficiency at part load it is essential to use a regenerator or recuperator. These have given problems of durability but are now improved.

High temperature materials. In the sizes of turbines of interest for vehicle and rail traction purposes, cooled turbine blades are not feasible, and currently available metals have limited the peak cycle temperature and hence the efficiency and are furthermore very expensive. A breakthrough in the use of engineering ceramics could have an important influence in terms both of fuel economy and first cost. Even Stirling engines have an even

longer history than either petrol or diesel engines. Their inherently high cycle efficiency—close to and ultimately possibly exceeding that of the diesel engine—their very low noise and low levels of emissions of exhaust pollutants make them attractive, but they also have a number of problems areas where breakthroughs are required:—

First cost and bulk. Current engines tend to be expensive and bulky.

Control. Currently achieved by varying the mean cycle pressure but requiring a multi-stage high pressure compressor, and involving inefficiencies with rapid load cycling.

Sealing. The working fluid (hydrogen or helium) at high pressure and temperature must be retained in the system over a long period.

High temperature/high pressure materials. The "hot end" of the engine is particularly demanding in its operational requirements.

While both the gas turbine and the Stirling engine also have advantages in being able to burn a wide range of fuels, the need for further development is likely to limit their use in service to the 1990s, and only then if the requisite breakthroughs occur.

3. With increasing pressure on liquid fuel reserves, will fuel characteristics change in ways which will favour one or other type of prime mover?

Apart from a possible lowering in the cetane number of diesel fuel, which would give problems in the light duty diesel engine, a possible need to run on wider cut fuels towards the end of the century, and a gradual worsening in the quality of the residual fuels which are burnt in the largest diesel engines, changes in fuel quality in fuels derived from petroleum crude are not likely to have an important effect on engine type or operation in the next 10 to 20 years.

Should appreciable quantities of methanol become available, manufactured from natural gas, or ethanol from the fermentation of vegetable matter, they would be much better burnt in a spark-ignition engine than a diesel engine, as their low cetane numbers lead to major combustion difficulties.

4. Will pressure on mineral resources lead to shortages of certain strategic metals which could limit either the technical development of the diesel

engine or its scale of production?

The high alloy materials which are used for the pre-combustion chambers of indirect injection diesel engines and for the turbine rotors of turbochargers are already very expensive and could ultimately become scarce. There is, however, considerable effort already being expended to produce engineering ceramic alternatives. Success in this area would eliminate a long-term risk to supply.

5. In the last twenty years or so legislation has begun to have an important impact on engine design and development. What effect will current or future legislation have on the diesel engine and its markets?

Fuel economy legislation will favour the diesel engine. The easiest way of meeting very low noise level targets is by cocooning the engine in sound-insulating material or by placing the engine in an acoustic tunnel. Either way a considerable reduction in noise is possible, but at the expense of weight, bulk, cost, and ease of access for maintenance. The engine structure may also be modified to reduce noise levels, but the available reductions in noise levels are lower. Legislative levels over the next 20 years are unlikely to provide insuperable targets for the diesel engine.

Exhaust emission levels however, and especially exhaust particulates, could prove a most difficult barrier for the diesel engine, particularly in the U.S. The small industrial engine market in the U.S. and the passenger car market worldwide could provide very large future markets for the diesel engine. In the U.S. a market penetration of up to 25 per cent for passenger cars has been talked about. Diesel engine exhaust particulate levels of some 20 times those of petrol engines are coming under heavy fire in the U.S., however, and the legislative limit of 0.2 g/mile which has been proposed for 1983 model year cars would prove difficult for the smaller diesel cars such as the Volkswagen Golf, and probably impossible for the heavier cars such as the Oldsmobile.

These levels are being justified not only from the standpoint of possible health effects but also of air quality. Even if the health effect proves to

be harmless, the effect on the "quality of life" emitting large amounts of solid material into the atmosphere will remain a focus of attack on the diesel engine, and this attack, if upheld, could split users into an attack on truck, bus, and other diesel engines operating in urban areas.

While it is difficult to forecast whether or not these U.S. legislative proposals will be upheld, they undoubtedly pose the most serious challenge which the diesel engine has had to meet so far. The challenge is made even more severe by the low levels of gaseous NO_x which are required. If the U.S. legislative proposals are endorsed, there is always the possibility that other countries will follow suit. Experience with earlier exhaust emission legislation would indicate, however, that apart from Japan the outlook for the diesel would be optimistic in other countries.

The likely market trends over the next twenty years or so are shown in the accompanying table. The large market openings available are in the small industrial and light duty vehicles fields, where the potential advantages in the U.S. are very large. Exhaust particulate legislation could, however, completely shut off these potential U.S. markets.

Fuel quality trends are likely to have any large impact on engine design or usage in this time scale, although they could influence the power plants emerging towards the end of the century. In certain special markets, however, methanol and ethanol might become available but would be used in spark-ignition engines, either with or without charge stratification.

In the smaller size of engine, high compression ratio developments of the current spark-ignited petrol engine are likely to be the most serious contender to the diesel engine. None of the other alternative powerplants would appear to have any promise of a large market share in the next 20 years.

The compound diesel engine, with reduced heat losses, but probably without the complications of a bottoming cycle may be used in high-power, low-haul trucks in five to ten years time.

C.C.J. French
Director, Ricardo Consulting Engineers Ltd.

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The struggle to save the city of St. Mark. By RUPERT CORNWELL in Venice

A monument survives in the mist



"When the acqua alta arrives, trestle tables are hastily assembled into an improvised walkway above the water."

THIS TIME of year you wonder why anyone actually lives in Venice at all. The wading path leads from the Rialto Bridge, the end of the causeway from the mainland, to the centre of the old city. It is a narrow, unpaved street, if possible, even more uncomfortable than the equivalent experience in a Rome bus. It is very damp and very cold.

Only black water lanes, meandering just a foot or so below the steps into St. Mark's Square. When the fog descends, the earliest moment of all, the lights in the palace along the Grand Canal are reduced to the palest glimmer, while other boats glide about like half-seen ghosts. You must expect to wake up in the morning and find the whole scene has vanished into the fog.

Between November and March every year the scirocco wind brings extra water up the Adriatic, into the lagoon and up into the square itself, on average 30 times. Even when it is dry, everyone seems to be wearing shoes with very thick rubber soles. When the acqua alta arrives, trestle tables stacked up next to the Doge's palace are hastily assembled into an improvised walkway above the water.

No wonder then that so many foreigners, when they see all this and the back-canal water which flows along and retreating boardwalks, assume that the fate of Venice is sealed, thanks to the inertia of the Italian authorities. Indeed, five years after the Rome Parliament passed a special law to help the city, progress towards its rescue seems maddeningly slow. Only last month the Government rejected every one of five schemes submitted in response to a tender, for projects to connect the water level in the lagoon instead of

Gaetano Stanzani, the Public Works Minister, has formed yet another commission which is to publish the result of its cogitations by next March.

Officials of the city and the Veneto region are reluctant to dramatise matters, an attitude which can easily be interpreted as complacency. In part it stems from a genuine conviction that things are not as bad as some times make out. "Venice is not going to disappear tomorrow, whatever the foreign papers may suggest," says Sig. Mario Rigo, the Socialist mayor, and in part from an understandable irritation at having to run a place that is not just a regional capital but a living museum about which most people with an interest in the arts have a passionate and almost proprietorial view.

Not sinking

To a certain extent a more relaxed line is justified. Now that industry no longer may extract water from the subsoil, Venice is for practical purposes sinking no longer, though claims that it is rising should be treated as warily as suggestions that the leaning tower of Pisa is moving back to the perpendicular. Moreover, the absence of serious damage to the city from the devastating earthquake of 1976 in Friuli, not so very far to the north, is proof of a kind that its foundations are pretty solid.

Venice is an extreme case, both as an example of the sloth and wrangling to which Italy's administrative structure lends itself, and of the dilemma of reconciling conservation with economic growth. This latter is epitomised in the argument over the schemes — in particular the proposal for a sort of giant inflatable dyke — to close off the three channels into the

lagoon. Malamocco, Lido and Chioggia, whenever a storm threatens.

That would obviously solve the problem of the acqua alta — but only, so its opponents claim, to the possible detriment of the functioning of the port of Venice, the city's largest single employer, which generates twice as much income as tourism. Whatever the risk of extra pollution, the Veneto authorities want to raise traffic from the present level of 24m tonnes annually to nearer its capacity of almost 50m, with the hope in turn of pushing up the number of jobs provided from 35,000 to conceivably 70,000.

But Sig. Rigo argues that if anything went wrong with so sophisticated a dam, ships could be trapped inside the lagoon, revenue be lost, and business could move to somewhere less troublesome, like Trieste. As for pollution, he points out that the historic city, with its 100,000 inhabitants has now switched from naphtha (with a high sulphur content) to methane for its gas supplies. The acqua alta do at least have the advantage of increasing the circulation of water through the canals, helping to keep Venice a little cleaner than it might otherwise have been. Only once pollution has been properly controlled, should the inflatable dams be installed. In the meantime, according to Sig. Mario Utiana, the regional commissioner in charge of dealing with the city's problems, L 580n (£36m) of anti-pollution work is under way, and a further L120bn is planned.

That then is the optimist's case. The heart of the pessimist's is the sheer impossibility of getting things done quickly. Venice affords a textbook study of the disadvantages of having too many tiers of government (a lesson, although

Britain is not Italy, that might not be entirely lost on the advocates of UK devolution). Central Government, the region and the city commune itself all have a finger in the pie. However, are settled within the tidal problem, and for restoring public buildings, the region for dealing with pollution, and for installing a decent sewage system. The city itself is responsible for refitting and restoring the houses in which Venetians have to live, so that the steady drain of population away from the city since the 1950s is finally reversed. Then

there are 30 organisations in 14 countries, and the wealth behind them, all devoted to "saving Venice". The longer money made available stays idle in the banks, the angrier they are apt to get.

It would all be very well if everyone were pulling in exactly the same direction; but in Italy things are rarely so simple, and least of all Venice, for which there often seem to be as many solutions as there are benefactors. As an added complication, the city and its poorer onshore cousins of Mestre and Marghera have elected a Com-

munist-Socialist coalition, which naturally tends to see things differently sometimes from the Christian Democrat controlled region.

For the Veneto authorities, Venice is only a part of an internationally-slanted master plan for the region. This would include a canal link inland to Padua, and ultimately into industrial Lombardy, and a brand new Venice-Munich motorway, a 20th century version of the age old link between the historic cities of northern Italy, like Venice, Padua, and Vicenza with central Europe. The

Veneto has joined an international "co-operative" along with eight other regions from Austria, Yugoslavia and West Germany, and Italy, dubbed Alpe-Adria, to promote the interests of an area which has always felt a little uncomfortable as a north eastern appendage of Italy.

Inevitably, at Ca' Farsetti, the Venice town hall, people tend to concentrate more on day-to-day problems. The left-wing administration is buying up homes, restoring them, and then hoping to keep the rents low enough for the original

occupants to come back, after an enforced stay in what the Italians crudely describe as a casa-sparpaglio or house to park yourself, outside the city.

Sig. Rigo has a pretty drastic idea of what should be done, which will not endear itself to the international cultural community. "You simply cannot have a free market of housing here. I want a law to stop flats and houses in Venice being sold to tourists. They must be kept for the Venetians. Remember, here we cannot build upwards or outwards." Those in search of the ultimate in elegant holiday apartments will be relieved to know that thanks to the opposition of the region the scheme is unlikely to get very far. Nor probably will another whereby Venice proper should be made into a separate administrative unit, cut loose from Mestre and Marghera.

In the meantime, it can take up to two years for approval to restore a single house, a symptom of what Sig. Rigo declares somewhat euphemistically, to be the "excessive perfectionism" which has bedevilled plans to bring back Venice to full health. But revival work is going on. Scaffolding surrounds many lovely palazzi. The floor of St. Mark's cathedral undulates disturbingly, but a man was lovingly restoring a bronze font lid in a side chapel.

What should never be forgotten, too, is that "saving Venice" means "saving" everything—not just the odd church and a few fine houses. The task inevitably will take a monumentally long time, and the arguments over how it should be done will drive many a foreigner well wiser, and not a few Italians as well, to something near despair. But at least the city is not simply going to disappear one of these foggy winter nights.

Letters to the Editor

Slumpflation in Britain

From Mr. H. Saxon Tate.

Sir—Samuel Brittan ended his December 14 article by saying "A political and economic system which forces people not to work when there are unmet needs which their production could supply does not deserve to survive." This immediately raises the question as to why it has survived in the future.

The Economic League is only too aware of an increasing number of people on the extreme Right and the extreme Left who are putting a considerable effort into engineering the system's downfall. One of the tools commonly used is the fallacy of the "hump of labour". To dismiss the fallacy one only needs a reasonably simple explanation of the modern British phenomenon called "slumpflation".

I suggest that this lies in deficient demand: that deficient demand has been brought about by insufficient discretionary disposable income: that insufficient discretionary disposable income has been brought about by low productivity; and that low productivity has been brought about by the general attitude of the British people.

We know very well that one working hour in the United States of Germany adds something between two and three times the value of one working hour elsewhere in Britain. Labour leaders in North America have an attitude which says "Look at the boss riding about in that Cadillac. One day I will own one of those." This is an attitude which helps to increase productivity and thus increases demand, either through higher purchasing power or lower cost of goods.

Their opposites number in Great Britain by and large, will say "Look at that idle rich man riding about in a Rolls-Royce—I haven't got one therefore he shouldn't have one—take it off him." This unproductive attitude has led to the current situation in which anybody who works hard and thrives soon finds he must hand over by far the greater part of his income to the taxman. So why make an effort or take a risk when one might be far safer to join a union?

I submit that we shall continue to suffer from unemployment problems and fail to match the standard of living of other main industrial countries until the population of this country accept the vital need for a change in attitude. It is encouraging that in the last few years British companies have started to put a considerable effort into programmes designed to help employees understand the economic workings of their organisations. This is evidenced by the numbers of companies now producing their annual report and accounts in a form which the layman can easily understand, making it freely available to all employees and spending time and effort helping people understand the contents.

I fear, however, that this alone will not be enough to have much effect, and as far as I am aware it only happens in the free enterprise parts of the economy. Moreover, the effort is substantially muted by the current education system which

appears designed to avoid teaching children that if they try to get ahead they will share their wealth less and less. As the great majority of children are today educated by state-controlled schools, there appears to be only one remedy, and that remedy lies in the hands of the Government. Only a change in what we are taught can eventually alter the "he shouldn't have more than me" syndrome. Significant changes to schools' curricula are needed and these are only likely to come from a free enterprise Government, and they would not doubt be strongly resisted by certain trade unions and various other parts of the establishment.

I suggest that until we get a Government which is strong enough, determined enough and far-sighted enough to do so, this country will continue to suffer from high unemployment, low productivity, insufficient demand and insufficient investment, all of which add up to a low standard of living.

H. Saxon Tate, The Economic League, First Floor, Asphalt House, Palace Street, SW1.

Norbition No. 14

From Mr. D. Wilkins.

Sir—I was intrigued to learn from Mr. Edward's letter (January 4) that the Greater London Council's award-winning refuse transfer station at Brentford is painted in "Norbition No. 14". Does this imply that our district gives its name to no less than 13 other shades and if so

The passenger and his needs

From Mr. T. Bates.

Sir—MD (December 21) invites air passengers to institute an organised grading system for the world's airports, akin to IATA's. He also states that many airport authorities, and especially the British Airports Authority, are aware of passenger ("pax") requirements and seek to incorporate them in their planning. As a "pax" who travels relatively often and frequently, I would, with respect, disagree. Many "modern" airports, such as Roissy, Marita, Landretter, Gatwick and "heaven" itself—Heathrow—would immediately be awarded my black star. My white star would grace the convenience of O'Hara (which copes admirably with more flights and passengers than any other airport in the world), Kennedy, Fiumicino, and Orly.

True, when passing through one of my black star airports, and there are no other flights arriving or departing, these airports are clean, comfortable, and sometimes swift to pass through. But MD's planning, based on his list of "pax" requirements, all too often fails to meet passenger needs because the planning ignores the most vital need.

In an ideal world, all that an airport requires is a long corridor, wide enough to take a series of desks with adjacent facilities for boarding and leaving aircraft. Unfortunately, however, in the real world, it is an undoubted fact that world-wide, less than 10 per cent of flights are "on time," often

what, please, are they? Or is one shade and one number allocated to each district in the manner of "Neasden No. 11" or "Sutton No. 17"? If the latter is the case, I assume there is an appropriate colour for Brentford and use of this would surely have been more logical, if not necessarily more pleasing from the aesthetic point of view.

David J. Wilkins, 118 Gloucester Road, Norbiton, Kingston upon Thames, Surrey

The strike weapon

From Mr. L. Sutton.

Sir—It is easy enough to speak in a general way of desires and principles, but more difficult to see where the one ends and the other begins.

No doubt Mr. Imrie (December 19) regards it as a point of principle that he should provide properly for his wife and children; no doubt, also, governments desire to provide the civil service at reasonable cost to society. Should Mr. Imrie abandon that principle in order to satisfy the desires of government? Or should he instead satisfy Miss Gough (December 28) who argues that "any employed person is free to resign if he dislikes his conditions of employment" and sacrifice his family's standard of living rather than give in to his own principles (or are they now "desires")?

To the extent that employers desire to contain their costs, and employees desire to maintain—or even improve—their standard of living, then Mr. Brittan (January 2) is right when he says that we are in the

midst of a "civil war"; this war has been going on for a very long time. The great majority of disputes that inevitably arise, however, are settled within the normal negotiating procedures, and only when these have failed is there normally recourse to industrial action.

The real dilemma is indeed a moral one, but it does not lie between principles on the one hand and desires on the other. The real dilemma for people such as your correspondents surely occurs when, for example—as both Miss Gough and Mr. Imrie have pointed out—governments decide unilaterally to abrogate agreements reached through normal negotiating procedures or act unfairly in their interpretation of their own "pay policy". In such circumstances, when governments act immorally, are employees wise to refuse to take up the only weapon left available on a point of dubious "principle" which may, in any case, include a desire (and a perfectly reasonable one) to be seen to be acting more responsibly than the other chap?

L. A. Sutton, 12, Panslams Road, Saffron Walden, Essex.

Do not blame the worker

From Mr. S. Penwill.

Sir—In your general news summary of January 3 it was stated that "more people reached work than many industries (sic) had feared." The worker is often blamed for the troubles of industry, but is this not getting a little too far? S. W. Penwill, 158, Fenchurch Street, EC3.

In the great tradition of merchant adventurers...

"Nice material, Marco" observed the Duke, fondling the silly suit-length which his recently returned Far Eastern emissary was displaying on the steps of the Palazzo. "But where's the tailor to do it justice?"

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- GENERAL**
Top-level Canadian mission led by Mr. Jack H. Horner, Minister of Industry, Trade and Commerce, in Peking, China, for trade talks.
- COMPANY RESULTS**
Final dividends: Caplan Profile Group, Reo Stakis Organisation, Interim dividends: Brown and Tawse, Hogg Robinson Group, Interim figures: Negretti and Zambra, Great Northern Investment.
- COMPANY MEETINGS**
See Week's Financial Diary on Page 33.
- EXHIBITIONS**
London International Boat Show, Earls Court (ends January 14). Holidays '79 Camping Out-door Holiday Exhibition and Motor Caravan Show (ends January 14). Model Engineering Exhibition, Wembley Conference Centre, Middlesex (ends January 13). Racing and Sporting Motorcycle Show, Horticultural Halls, London, SW1 (ends January 14). BFM Furniture Show, National Exhibition Centre, Birmingham (ends January 10).
- SPORT**
Soccer: F.A. Cup, Fourth Round Draw, London, noon. Rugby Union: Announcement of England training squad. Racing: Leicester, Sedgfield.
- CITY OF LONDON LUNCHTIME MUSIC**
All Hallowes-by-the-Tower, recorded music, 1 pm. St. Lawrence Jewry next Guildhall, piano recital, Mark Troop, 1 pm. St. Michael Cornhill, organ recital, Michael Stuckley, 1 pm.
- CITY OF LONDON SPECIAL CRUICER SERVICES**
St. Martin, Ludgate, Epiphany carol service in aid of the Greater London Fund for the Blind, Cecilia Singers directed by George F. Tull, 1 pm.

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UK COMPANY NEWS

CMT forecasts expansion as product demand rises

In the current year, demand for the products of Central Manufacturing and Trading Group is continuing to improve...

BOARD MEETINGS

The following companies have notified dates of board meetings to the Stock Exchange...

FUTURE DATES

As reported on December 14, struck this time after exchange fluctuations of £355,204...

Downturn at D. C. Thomson

Trading profits of D. C. Thomson and Company, Scottish newspaper owner and publisher, were down from £4.87m to £3.21m in the year ended March 31, 1978...

Whessoe prospects

IN HIS annual statement, Lord Erroll, the chairman of Whessoe, says that for the current year, Aiton, light engineering and overseas heavy engineering subsidiaries are expected to maintain performance and profits much in line with the previous year...

STAVERT ZIGOMALA

A PROFITS improvement is announced by Stavert Zigomala and Co. (Hdgs.), furniture wholesalers and investment company...

INVESTMENT OPPORTUNITIES

DIAMONDS FOR INVESTMENT Diamond selection limited offer loose-cut and polished diamonds...

COMPANY NOTICES

NACIONAL FINANCIERA S.A. S.U.S. 100,000,000 Floating Rate Notes 1978/1981/1983

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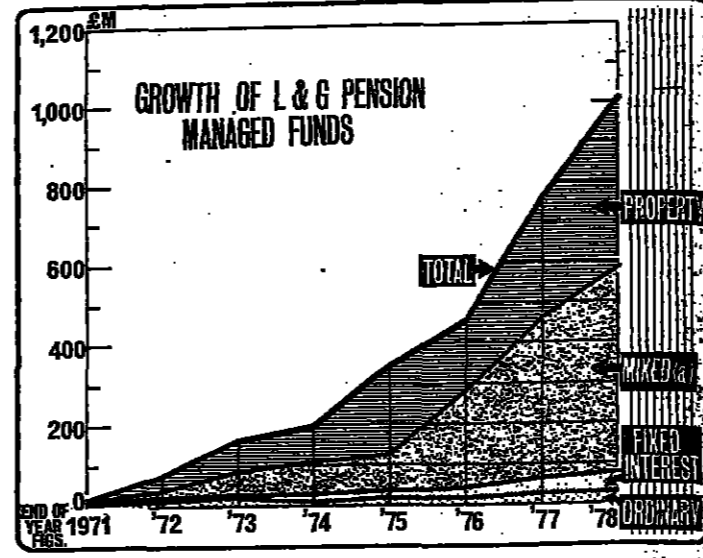
ART GALLERIES

MALL GALLERIES, The Mall, E.W.1. Heston Hubbard Art Society, Annual Exhibition, 10.30-5.00 until 13 January. Admission free.

NEWS ANALYSIS—MANAGED FUNDS

The best of both worlds

BY ERIC SHORT



INVESTMENT Management Services to Pension Funds have now become big business for life companies. Last week, Britain's largest pensions company, Legal and General Assurance, announced that funds managed by subsidiary Pensions Management had passed the £1bn mark in just over eight years.

The employer, or the trustee, can identify his assets without much bother. And he is not paying for any investment guarantee; he carries the investment risk himself, and gets the full benefit of good performance. If the fund performs well, the value of the units rises, and conversely if it performs badly.

The life companies will, and often do, discuss with clients their investment aims and philosophy. But the client does not change those views, if he disagrees. Other life companies feel that the client should be able to decide on the investment mix in conjunction with his consultant and other advisers.

This fund was invested across the whole range of investment media—equities, property, and fixed interest—and the return made to the client depended on two factors. These were the investment performance of the managers and the amount of profit the actuary was prepared to release following his valuation.

Brockhouse sees further progress

WITH A satisfactory outstanding order book and barring outside influences, Mr. R. J. H. Parkes, the chairman of Brockhouse, says the directors expect to make further progress in the current year.

BIDS AND DEALS

Hawthorn Leslie more than doubles Anglo Swiss stake

Engineering group Hawthorn Leslie may yet emerge as a major shareholder even more than a rival bid for Anglo Swiss Holdings for which Armstrong Equipment has agreed to pay £1.4m cash.

approach from Hawthorn Leslie or Armstrong. Mr. Harry Hooper, says that under his banner he would expect Anglo to be making profit by the end of 1979.

Canada's largest trust company, has formed a new wholly-owned insurance broking subsidiary Ruystr Insurance Services.

LADBROKE OFFER UNCONDITIONAL

Acceptances of the recommended offer on behalf of the Ladbroke Group for the whole of Myddleton Hotels not already owned, have been received from over 81 per cent of the holders of Myddleton ordinary shares.

SHARE STAKES

Johnson Matthey Johannesburg Consolidated Investment holds 3,907,700 shares, Prudential Assurance 855,227, and Anglo American Corporation of South Africa 851,000 each over 5 per cent.

LOCAL AUTHORITY BOND TABLE

Table with columns: Authority, Annual Interest, Minimum sum, Life. Lists various local authority bonds and their terms.

SIMCO MONEY FUNDS

Table with columns: Call, 7 day, % p.a., % p.a. Lists interest rates for various Simco Money Funds.

FINANCE FOR INDUSTRY TERM DEPOSITS

Table with columns: Terms (years), 3, 4, 5, 6, 7, 8, 9, 10. Lists interest rates for industry term deposits.

Capital expenditure on plant and machinery is now reflecting improved performance and we confidently expect this trend to continue

Our outstanding order book is satisfactory and of a better quality. Barring outside influences we expect to make further progress in the year ahead.

Advertisement for Fuqua Industries, Inc. featuring a large 'F/I' logo and text: 'U.S. \$30,000,000 Medium Term Loan', 'Managed by Chemical Bank International Group', 'Crockro National Bank', 'Continental Illinois Limited', 'Provided by Algemene Bank Nederland N.V., Continental Illinois National Bank and Trust Company of Chicago, Credit Suisse, Dresdner Bank AG (Grand Cayman Branch)', 'Agent CHEMICAL BANK INTERNATIONAL LIMITED', 'December 1978'.

PENDING DIVIDENDS

Table listing pending dividends for various companies, including dates, announcement dates, and amounts.

BASE LENDING RATES

Table listing base lending rates for various banks and financial institutions, including A.B.N. Bank, Allied Irish Banks Ltd, Amro Bank, etc.

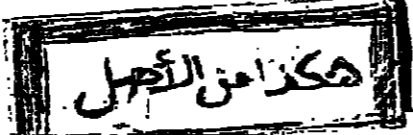
MEMBERS OF THE ACCEPTING HOUSES COMMITTEE

Table listing members of the Accepting Houses Committee, including names and addresses.

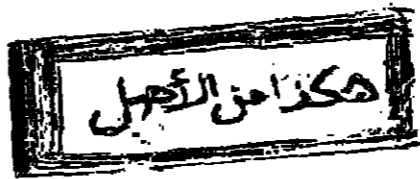
WORLDWIDE FUND LIMITED

A commodity futures trading fund. Net Asset Value per \$1 share as at 29th Dec. 1978 \$11.61

Advertisement for Brockhouse Limited, featuring a large 'B' logo and text: 'HILL TOP, WEST BROMWICH, WEST MIDLANDS', 'Capital expenditure on plant and machinery is now reflecting improved performance and we confidently expect this trend to continue', 'R. J. H. Parkes, Chairman', 'Other salient points from the Chairman's Statement', 'Export sales have shown a considerable advance and we shall continue to give high priority to this area of our activity.', 'Selling prices and margins continue to be under pressure and although profit at £3.5m is well in advance of last year it is below our target.', '£2.4m was invested during the year on plant, machinery and buildings. Expenditure in the year ahead will exceed £3.5m. Our financial resources are adequate to meet this programme.', 'Results to 30th Sept. 1978: Sales £69m up from £61m, Profit before tax £3.5m up from £2.6m, Profit after tax £2.6m up from £2.5m, Dividend per share 4.0463p up from 3.6235p, Earnings per share 15.11p up from 14.72p'.



INTERNATIONAL COMPANIES and FINANCE



RECENT ISSUES

\$184m offer for Mission Insurance

By Our Financial Staff
AMERICAN International, a major U.S. insurance group, has bid \$184m in cash-and-shares for the capital of Mission Insurance, a company heavily involved in the workmen's compensation market...

NATIONAL AIRLINES

CAB ruling on takeover is facing delay

By JOHN WYLES IN NEW YORK

A GOVERNMENT decision on the merger battle being waged over National Airlines will almost certainly be delayed by the surprise \$425m bid by Eastern Airlines for the Miami-based carrier...

However, this timetable unusually speedy for the CAB since the TXIA and Pan Am applications were made late last summer and early autumn, is now in ruins. Following the Eastern proposal another law judge will be appointed shortly to open separate hearings on the merits of Eastern's proposal and the CAB's earliest estimate of a final decision is now late May...

almost certainly forced a postponement of the meeting of National shareholders scheduled for January 13. National has been preparing a proxy statement recommending acceptance of Pan Am's \$41 a share offer, subject to government approval. The airline's board met last week to review the Eastern offer but apparently did not come to a final decision...

Table with columns: Issue Price, 1978/79, Stock, Dividend, etc. Includes entries like Ashton Mining, Aust. Farming, etc.

Table with columns: Issue Price, 1978/79, Stock, Dividend, etc. Includes entries like Associated Biscuit, Bournville, etc.

Table with columns: Issue Price, 1978/79, Stock, Dividend, etc. Includes entries like Associated Biscuit, Bournville, etc.

General Cinema withdraws bid for Columbia

By David Lascelles in New York
GENERAL CINEMA has withdrawn its bid for about 20 per cent of Columbia Pictures after rejection of its offer by Columbia's board...

Recovery at Shell Nederland

By CHARLES BATCHELOR IN AMSTERDAM

SHELL NEDERLAND reports an improvement in refinery activities in Holland for the final quarter of 1978 though there was little change in the chemicals division. The company made a profit on its refinery operations in the past three months of the year due to the reasonable price level it achieved for its products...

Writ by Moscow Narodny

By JAMES BARTHOLOMEW

MOSCOW NARODNY Bank, the Russian-owned bank registered in London, has issued a \$20m writ in Hong Kong against Mr. Chua Kung Siew, a local businessman. Moscow Narodny rapidly developed a large lending business in the Far East in the early 1970s...

Lay-offs at American Motors and Chrysler

By OUR NEW YORK STAFF

MORE THAN 13,000 U.S. car workers will be laid off this week by the industry's two troubled manufacturers. American Motors and Chrysler Corporation, both of which are struggling against weak demand. American Motors' problem appears the more critical with car sales in December falling by 29 per cent and dealers sitting on enough stocks to last a full five months at current selling rates...

Public Works Loan Board rates

Effective from January 6
Non-quota loans A* repaid at
Up to 5 years 13 13 13 13 13
Over 5, up to 10 13 13 13 13 13
Over 10, up to 15 13 13 13 13 13
Over 15, up to 25 13 13 13 13 13
Over 25 13 13 13 13 13

CURRENCIES, MONEY and GOLD

Nervous interest rates

By COLIN MELHAM

Interest rates moved rather nervously in the world's major financial markets last week. Foreign exchange dealers were doubtful about the dollar's movements over the next few months, and although the U.S. currency required substantial support from central banks when the new year opened, it was trading fairly steadily by the end of the week...

and by Wednesday Fed funds were back around 10 per cent which was presumed to be the target rate of the authorities. On Thursday foreign exchange trading was thin, but the market remained alive with rumours concerning a possible rise in the U.S. prime lending rates in the near future, and an increase in the Fed's reserve discount rate. By the end of the week the discount rate was still 9 1/2 per cent, and prime rates remained at 11 1/2 per cent.

Table with columns: Jan. 5, Jan. 4, Gold Bullion, Gold Coins, etc. Includes entries like Gold Bullion, Gold Coins, etc.

THE POUND SPOT

Table with columns: Jan. 5, Day's Spread, Close, etc. Includes entries like U.S. \$, Canadian \$, etc.

FORWARD AGAINST £

Table with columns: Jan. 5, Day's Spread, Close, etc. Includes entries like U.S. \$, Canadian \$, etc.

OTHER MARKETS

Table with columns: Jan. 5, Close, etc. Includes entries like Argentina Peso, Australia Dollar, etc.

EXCHANGE CROSS RATES

Table with columns: Jan. 5, Pound Sterling, U.S. Dollar, etc. Includes entries like Pound Sterling, U.S. Dollar, etc.

MONEY RATES

Table with columns: Jan. 5, Prime Rate, etc. Includes entries like Prime Rate, Fed Funds, etc.

LONDON MONEY RATES

Table with columns: Jan. 5, Starting Certificate on deposit, etc. Includes entries like Overnight, 8 days notice, etc.

NEW YORK

Table with columns: Prime Rate, Fed Funds, etc. Includes entries like Prime Rate, Fed Funds, etc.

FRANCE

Table with columns: Discount Rate, etc. Includes entries like Discount Rate, etc.

JAPAN

Table with columns: Discount Rate, etc. Includes entries like Discount Rate, etc.



The man most likely to succeed in '79

Making the right decisions in business and personal investment is simple: you have to stay on your toes, and keep an ear to the ground. Simple—but not easy. In fact, in the unpredictable economic climate of the seventies, making the right decisions often looks virtually impossible. At the Investors Chronicle, we try to make it easier than it looks. Which is why, a year ago, we changed our magazine radically, to supply what every senior businessman and investor needs—a decision-taker's digest. Every Friday, we offer the facts, analysis and background that help our readers make crucial decisions successfully. Personal investment decisions. Corporate investment decisions. Business decisions. We offer the facts: does anybody want them? Apparently, yes. Since we changed, our subscribing readers are up 27%. Our total sales have increased by more than 1,500 a week—and the trend is still upwards. And are we contributing to success? Again, it looks as though we are: we now have more readers earning £10,000 p.a., and more readers who are directors than any other weekly business magazine. And again, the trend is up. If people like that find us indispensable, mightn't you? The Investors Chronicle: in your newsagents, every Friday. Pick up a copy—improve your chances of success in '79.



The financial weekly that really means business.

INSURANCE

APPOINTMENTS

WORLD STOCK MARKETS

Keeping up with cost of bricks and mortar Managing director of GEC-Fairchild

BY OUR INSURANCE CORRESPONDENT

FIVE YEARS ago the Royal Institution of Chartered Surveyors began to monitor regularly the movement of house construction...

Mr. David Marriott has been appointed managing director of GEC-FAIRCHILD, the joint venture...

up of five shipping lines; Ben Line, Blue Star Line, The Cunard Steam-Ship Company, the Ellerman Lines and Harrison Line.

Admiral Sir John Treacher has accepted an invitation to join the Board of WESTLAND AIRCRAFT.

The Secretary of State for Scotland has nominated Mr. J. Murray to be a member of the special panel of the TRANSPORT TRIBUNAL.

Mr. Andrew Salvesen has been appointed a director of CHRISTIAN SALVESEN (MANAGERS), the senior operating company of the Salvesen group.

At MOBIL OIL COMPANY Mr. D. Broadhead has been appointed plans and programmes director in succession to Mr. D. Crann.

Mr. J. E. Chilcott, formerly commercial director of the rolled products division of the BRITISH ALUMINIUM COMPANY, has been appointed commercial director of the B.A. group.

Mr. Brian D. Innes becomes general manager, commercial, of GKN Group on March 1 when he will relinquish his positions as managing director of Salisbury Transmission and a director of GKN Axles.

Mr. J. A. Franks has been appointed non-executive director of CORINTHIAN HOLDINGS.

Mr. Jeremy Potter becomes group director of corporate affairs for LONDON WEEKEND TELEVISION on July 1 when he joins the Boards of LWT (Holdings) and London Weekend Television.

Mr. Morris Kleiner has become deputy managing director of BAMBERS STORES, joining the Board as Mr. E. S. Brower, Mr. A. V. Wettrich, Mr. L. Slapper and Mr. D. Wettrich.

Mr. R. Alastair Lloyd, director of Ellerman Lines and deputy chairman of Ellerman City Liners, has been appointed chairman of ASSOCIATED CONTAINER TRANSPORTATION (ACT) in succession to Mr. H. R. MacLeod, joint managing director of Ben Line. ACT is made

Arson bill

A total of 306 were caused maliciously or intentionally, at a cost of £42.8m. Even more fires, 387, were of unknown origin and their cost is reckoned to have been £66.5m.

In this context last year's direct fire damage bill—likely to be about £90m—probably means that the cost of arson rose to £80m or £100m.

Such independent information provides ammunition for insurers to fire at policy-holders who neglect to revise sums insured.

TEL AVIV

Banking, Insurance and Finance Bank Leumi Levant 383 + 1.5

The institution does not expect the rate of the index to stay below 10 per cent this year.

Building workers' wages will be settled in June, but already heating and ventilating workers and plumbers have received about 16 per cent, and electricians have asked for a basic 43 per cent increase.

Last year, despite continuing pay restraint, labour costs rose by 15.4 per cent.

The institution reckons that building labour costs may increase by only 12 per cent in 1979, but insurers and policy-holders can surely expect construction costs to rise by more than 15 per cent this year.

WALL STREET

NEW YORK

Table of New York stock market data including columns for High, Low, Stock, and Jan 5 prices.

CANADA

Table of Canadian stock market data including columns for High, Low, Stock, and Jan 5 prices.

Indices

NEW YORK

Table of New York indices including Industrial, DOW Jones, and Utility indices.

STANDARD AND POORS

Table of Standard and Poors indices including Industrial, Composite, and Utility indices.

EUROPE

AMSTERDAM

Table of Amsterdam stock market data.

BRUSSELS/LUXEMBOURG

Table of Brussels/Luxembourg stock market data.

COPENHAGEN

Table of Copenhagen stock market data.

VIENNA

Table of Vienna stock market data.

CANADA

Table of Canadian stock market data.

GERMANY

Table of German stock market data.

MILAN

Table of Milan stock market data.

OSLO

Table of Oslo stock market data.

PARIS

Table of Paris stock market data.

WORLD STOCK MARKETS

MONTECARLO

Table of Monte Carlo stock market data.

JOHANNESBURG

Table of Johannesburg stock market data.

FRIDAY'S ACTIVE STOCKS

Table of Friday's active stocks including American Home Prod., Revlon, and others.

TOKYO

Table of Tokyo stock market data.

STOCKHOLM

Table of Stockholm stock market data.

SWITZERLAND

Table of Swiss stock market data.

AUSTRALIA

Table of Australian stock market data.

JOHANNESBURG MINES

Table of Johannesburg mines stock market data.

BRASIL

Table of Brazilian stock market data.

JOHANNESBURG

Table of Johannesburg stock market data.

INDUSTRIALS

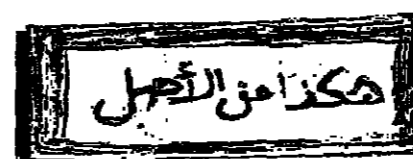
Table of industrial stock market data.

SECURITIES

Table of securities market data.

NOTES

NOTES: Overseas prices exclude 3 per cent premium, Belgian dividends are after withholding tax.



INTERNATIONAL CAPITAL MARKETS

BY NICHOLAS COLCHESTER

Christmas hides dollar blues

WHILE THE champagne flowed the dollar sector of the international bond market pulled off a steady correction of some magnitude. The new issues in December, the Yankee Euro and European Coal and Steel were priced to yield 9.38 per cent and 9.44 per cent respectively. At their new year prices they yield 9.32 per cent and 9.28 per cent respectively leaving their holders - Christmas apart - some 3 per cent poorer.

Euro-issues and is teetering on the brink of 10 per cent for the best borrowers. Kuhn, Loeb Lehman, which compiles lists of comparative yields, pointed out the attractive returns available on Yankee issues at the start of the week: the EIB Yankee 8 1/2 per cent, 1992, offered a yield of 9.96 per cent, which would be equivalent to an annual coupon of 9.99 per cent. This is the only straight dollar bond currently emerging in this difficult market.

and primary markets. Prices were up in general: liquidity is high and is due to get its seasonal boost from coupon payments, the German steel strike lingered on (though a blue-ink print for an end to it was drawn up the weekend) and with it the chance for reduced demand for credit, and there was a better tone in the domestic bond market. One exception was the recent issue for the European Investment Bank which slid to 9 1/4 from its issue price of 9 1/2.

part of Swiss investors. The shorter instrument was the more unpopular of the two - perhaps because the customary indication of price was not forthcoming. Commerzbank should today announce terms in a DM 100m private placement for New Zealand. Deutsche Bank will also launch a DM 100m public issue for an unnamed borrower. The prevailing gloom about the dollar has not helped the Swiss foreign bond primary market where the main problem is the reluctance of borrowers to expose themselves to the franc. There was not one public bond issue in December and the start of the year looks fairly thin with an ICI refinancing and issues for New Zealand and the Asian Development Bank the only features on the schedule.

Some bankers now feel that a really good borrower could get away with 3.5 per cent. All this is good news for holders of existing bonds where prices bounded up last week by an average of 1 1/2 points.

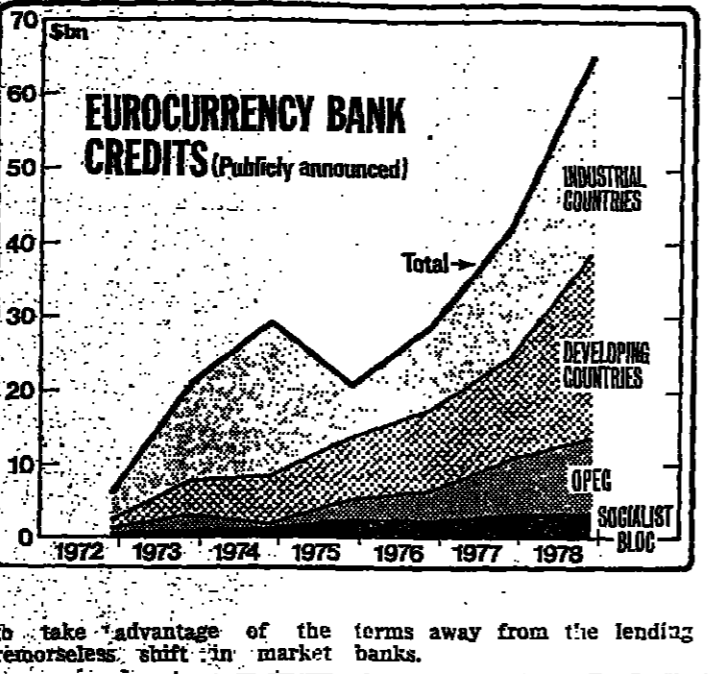
SONOTRADE INDEX AND YIELD table with columns for January 5, December 29, High, Low, and U.S. dollar bonds.

EUROCURRENCY LOANS

BY JOHN EVANS

Japan spearheads rising loan volume

THE TOTAL OF Eurocurrency syndicated bank loans rose in 1978 ballooned to a record gross level of \$85.4bn, up from the 1977 figure of \$41.7bn. But last year's debt totals are particularly misleading. The grand total disguises a heavy amount of refinancing of past loans or related debt restructuring by a wide range of borrowers.



However, the OECD, in its recent Financial Market Trends publication, calculated that such operations amounted to one-quarter to one-third of all Eurocredits raised in third-quarter 1978, which were running at an annual rate of \$51.9bn in that quarter. Taking gross figures, the industrial countries again account for the largest single chunk of last year's syndicated borrowings, with \$26.6bn or 40 per cent of the total, according to Morgan Guaranty's latest World Financial Markets.

U.S. BONDS

BY STEWART FLEMING

Signs of calmer conditions

AFTER THE losses suffered by investors and traders in Wall Street's bond markets in the last months of 1978, the first week of the new year has come as a welcome relief. Bond prices generally firmed after a week first day's trading last Tuesday and short-term interest rates have, for the time being, halted their dizzying upward spiral. There have been declines of between five and 10 basis points (100 basis points equals one percentage point) in interest rates across most money market instruments, with three-month commercial paper, for example, yielding 10.45 per cent at the end of the week and six-month prime bank certificates of deposit yielding 11.40 per cent, according to estimates by Salomon Brothers.

The money markets have been reassured, too, by the slowing in the growth of the money supply in the past three months over this period. According to Bankers Trust, the narrow money supply measure M1 has declined.

Some suspect that this may be due to banks paying interest on demand deposits and the flow of funds into such deposits and out of the M1 category. But broader money measures, too, are slowing for the time being. As Chase Manhattan Bank says, few market participants are expecting this slower growth to be maintained for long. On the other hand, some analysts, including Dr. Henry Kaufman, of Salomon Brothers, sees in the fact that the Fed has not eased monetary policy in response to slower money growth and a firmer dollar, signs of a stricter monetary policy stance by the Fed. At the moment, however, with fourth quarter growth, predicted by the Carter Administration to be close to 5 per cent, the Fed can afford to err on the side of firmness in support of the dollar.

U.S. Government still had to offer investors record returns last week on its latest financing. On Wednesday, one year Treasury bills were sold at a discount which offered investors an equivalent yield of just over 10 1/2 per cent, and on Thursday the Treasury sold 15-year bonds at a yield of 9 per cent. But this was between 10 and 15 basis points below the yield expected earlier in the week. In the coming week investors will focus on Thursday's announcement from the Commerce Department of producer price indexes for December and on Friday's report on the employment situation for that month. On Friday of last week the Federal Reserve confirmed the continued underlying strength of demand for credit late last year in its report that consumer credit rose by \$4.1bn that month, the highest since June 1978. In the markets, Norway is due to sell \$100m of notes due in 1984 and rated triple A by Moody's on Thursday.

FT INTERNATIONAL BOND SERVICE

The list shows the 20 latest international bonds for which an adequate secondary market exists. The prices over the past week were: Bids, Kreditsbank AG; Credit Commercial de France; Credit Lyonnais; E. F. Huton Services SABL; Commerzbank AG; Deutsche Bank AG; Westdeutsche Landesbank; Grunzweig; Banque Internationale Luxembourg; Kredit Bank Luxembourg; Allgemeine Bank Nederland NV; Pierson, Witting and Pierson; Credit Suisse; Credit Agricole; Union Bank of Switzerland; Aktov and Smilberg; Bankers Trust International; Banque Francaise de Credit International; Citicorp International Bank; Djawa Europa NV; Datsac Trading Company; Dillon, Read Overseas Corporation; EBC; First Chicago; Goldman Sachs International Corporation; Hambro Bank; International Hill Samuels and Co.; Kilder Peabody; International Morgan Stanley International; Heald; Thomson; Salomon Brothers; International; Samuel Montagu and Co.; Scandinavian Bank; Strauss Turnbull and Co.; Sumitomo Finance International; S. G. Warburg and Co.; Wood Gundy.

Table of U.S. Dollar bonds with columns for Issued, Bid, Offer, Change on week, and Yield.

Table of Other Straights bonds with columns for Issued, Bid, Offer, Change on week, and Yield.

Table of Deutsche Mark bonds with columns for Issued, Bid, Offer, Change on week, and Yield.

Table of Floating Rate bonds with columns for Spread, Bid, Offer, C. rate, C. coupon, and Yield.

Table of Swiss Franc bonds with columns for Issued, Bid, Offer, Change on week, and Yield.

Table of Convertible bonds with columns for Issued, Bid, Offer, Change on week, and Yield.

Table of Yen Straights bonds with columns for Issued, Bid, Offer, Change on week, and Yield.

Banking Group Volume of loans in US\$bn No of deals. 1. Bank of Tokyo 24.3 97. 2. Citicorp 24.1 113. 3. NatWest 21.7 75. 4. Chase Manhattan 21.5 116. 5. Toronto-Dominion 17.4 40. 6. Bank America 16.5 72. 7. Industrial Bank of Japan 16.2 57. 8. Bankers Trust 15.9 54. 9. Manufacturers Hanover 15.6 63. 10. Lloyds Bank 15.3 57. 11. Chemical Bank 14.8 57. 12. Sanwa Bank 14.4 46. 13. WestLB 14.6 57. 14. Tokai Bank 14.5 56. 15. Deutsche Bank 14.3 57. 16. Morgan Guaranty 14.2 53. 17. BNP 13.8 40. 18. Royal Bank of Canada 13.4 49. 19. Mizuho Bank 13.1 44. 20. ABN 12.9 32. 21. UBS 12.8 35. 22. Citibank 12.7 34. 23. Barclays Bank 12.7 42. 24. Dresdner Bank 12.5 32. 25. Commerzbank 12.3 36.



Why you should employ a security company with a 95% failure rate

We're proud of our failures. They're one of the reasons why we're so good at our job. Group 4 standards are the highest. Right from the start. The material that goes into our uniforms is only the very best - as 95 out of every 100 of the people we interview will testify. And the 5% who do make the grade are subjected to a total security Training Programme which is second to none. We're every bit as particular about the equipment we install. From buzzers and alarms right through to master control systems. In fact, our Quality Control, testing and checking procedures are so comprehensive that we could be criticised for being over-cautious. But in our business you can't be. We're part of the largest security company in Europe and the world. With over 70 years of experience behind us. We've a reputation to protect. And in a funny sort of way, it's our failures that keep us intact. Giving the world a sense of security.

AUTHORISED UNIT TRUSTS

OFFSHORE AND OVERSEAS FUNDS

Table listing various unit trusts such as Abbey Unit Trst. Mgrs. Ltd., Framlington Unit Mgt. Ltd., and others, including their names, addresses, and contact information.

Table listing various unit trusts such as Minister Fund Managers Ltd., Quilter Management Co. Ltd., and others, including their names, addresses, and contact information.

Table listing various unit trusts such as Schiesinger Trust Mgrs. Ltd., Target Trst. Mgrs. (Scotland) (s) (t), and others, including their names, addresses, and contact information.

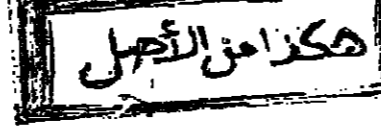
Table listing various offshore and overseas funds such as Alexander Fund, Keyser Ullmann Ltd., and others, including their names, addresses, and contact information.

Table titled 'CORAL INDEX: Close 476.481' and 'INSURANCE BASE RATES' showing various financial metrics and rates.

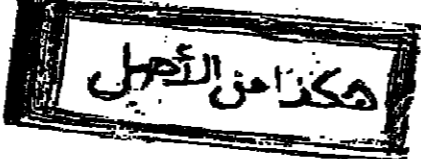
Table titled 'INSURANCE AND PROPERTY BONDS' listing various insurance and property bond products and their details.

Table titled 'INSURANCE AND PROPERTY BONDS' listing various insurance and property bond products and their details.

Table titled 'INSURANCE AND PROPERTY BONDS' listing various insurance and property bond products and their details.



NOTES section containing various financial notes and disclosures.



BUSINESSMAN'S DIARY

UK TRADE FAIRS AND EXHIBITIONS

Table listing UK trade fairs and exhibitions with columns for Title, Venue, and Dates.

OVERSEAS TRADE FAIRS AND EXHIBITIONS

Table listing overseas trade fairs and exhibitions with columns for Title, Venue, and Dates.

BUSINESS AND MANAGEMENT CONFERENCES

Table listing business and management conferences with columns for Title, Venue, and Dates.

WEEK'S FINANCIAL DIARY

The following is a record of the principal business and financial engagements during the week. The Board meetings are mainly for the purpose of considering dividends and official indications are not always available whether dividends concerned are interims or final.

Table of financial diary entries including company names, dates, and financial details.

CONTRACTS

Defence orders for Racal receivers

RACAL COMMUNICATIONS, the Bracknell-based communications systems company, has been awarded orders worth almost £2m by the Ministry of Defence.

The BBC has awarded a £50,000 contract to the transmission division of PLESSEY TELECOMMUNICATIONS INTERNATIONAL at Beeston, Nottingham.

Motor Industry Surveys 1979 advertisement with large text and detailed description of the surveys.

C.M.T. advertisement featuring a large headline, text about industrial services, metal processing, and steel stockholding, along with financial data and charts.

FOOD, GROCERIES—Cont.

Table listing various food and grocery stocks with columns for Stock, Price, Last, Div, Yield, and P/E.

HOTELS AND CATERERS

Table listing hotel and catering stocks with columns for Stock, Price, Last, Div, Yield, and P/E.

INDUSTRIALS (Miscel.)

Table listing various industrial stocks with columns for Stock, Price, Last, Div, Yield, and P/E.

ENGINEERING—Continued

Table listing engineering stocks with columns for Stock, Price, Last, Div, Yield, and P/E.

DRAPERY AND STORES

Table listing drapery and store stocks with columns for Stock, Price, Last, Div, Yield, and P/E.

BANKS & HP—Continued

Table listing bank and home products stocks with columns for Stock, Price, Last, Div, Yield, and P/E.

CHEMICALS, PLASTICS—Cont.

Table listing chemical and plastic stocks with columns for Stock, Price, Last, Div, Yield, and P/E.

BEERS, WINES AND SPIRITS

Table listing beer, wine, and spirit stocks with columns for Stock, Price, Last, Div, Yield, and P/E.

BUILDING INDUSTRY, TIMBER AND RAILS

Table listing building, timber, and rail stocks with columns for Stock, Price, Last, Div, Yield, and P/E.

BANKS & HP—Continued

Table listing bank and home products stocks with columns for Stock, Price, Last, Div, Yield, and P/E.

BEERS, WINES AND SPIRITS

Table listing beer, wine, and spirit stocks with columns for Stock, Price, Last, Div, Yield, and P/E.

BUILDING INDUSTRY, TIMBER AND RAILS

Table listing building, timber, and rail stocks with columns for Stock, Price, Last, Div, Yield, and P/E.

BONDS & RAILS—Cont.

Table listing bond and rail stocks with columns for Stock, Price, Last, Div, Yield, and P/E.

AMERICAN EXCHANGES

Table listing American exchange stocks with columns for Stock, Price, Last, Div, Yield, and P/E.

CANADIANS

Table listing Canadian stocks with columns for Stock, Price, Last, Div, Yield, and P/E.

INTERNATIONAL FINANCIAL BULLETIN

A quarterly source of fiscal, financial and economic information with expert and in-depth review material.

BRITISH FUNDS

Table listing various British funds with columns for Stock, Price, Last, Div, Yield, and P/E.

COMMONWEALTH & AFRICAN LOANS

Table listing commonwealth and African loan stocks with columns for Stock, Price, Last, Div, Yield, and P/E.

FOREIGN BONDS & RAILS

Table listing foreign bond and rail stocks with columns for Stock, Price, Last, Div, Yield, and P/E.

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INDUSTRIALS - Continued table with columns for stock names, prices, and financial metrics.

INSURANCE - Continued table listing various insurance companies and their stock prices.

PROPERTY - Continued table detailing real estate and property-related financial data.

INVESTMENT TRUSTS - Continued table listing various investment trusts and their performance.

FINANCE, LAND - Continued table covering financial institutions and land-related investments.

SANWA BANK advertisement with logo and contact information for Tokyo, Japan.

MINES - Continued table listing various mining operations and their stock prices.

AUSTRALIAN TINS table listing Australian tin-related stocks and their values.

COPPER MISCELLANEOUS table listing copper-related stocks and other miscellaneous items.

GOLDS EX-S PREMIUM table listing gold-related stocks and premium information.

NOTES table listing various financial notes and their details.

TEAS table listing tea-related stocks and their prices.

MINES CENTRAL RAND table listing central Rand mining stocks.

MINES EASTERN RAND table listing eastern Rand mining stocks.

FAR WEST RAND table listing far west Rand mining stocks.

O.F.S. table listing O.F.S. related financial data.

FINANCE table listing various financial instruments and their prices.

DIAMOND AND PLATINUM table listing diamond and platinum-related stocks.

CENTRAL AFRICAN table listing central African financial data.

REGIONAL MARKETS table listing regional market data.

OPTIONS 3-month Call Rates table listing options and call rates.



THE MOST EFFICIENT AND WIDELY USED LORRY LOADER... GEORGE COHEN MACHINERY LTD

U.S. oil companies 'charged \$1bn too much'

By David Lascelles in New York... NINE of the largest U.S. oil companies have been accused by the U.S. Energy and Justice Departments of overcharging their customers by at least \$1bn.

Aluminium industry attacks BL £25m foundry scheme

BY ARTHUR SMITH, MIDLANDS CORRESPONDENT

BL COMPONENTS is to build a £24.7m aluminium foundry in Leeds. The plan, announced last night, provoked angry reactions within the private aluminium industry.

The new foundry will add seriously to the present 30 per cent spare capacity. BL has attempted to get the private sector to participate in the project, but it is believed that talks with Birmid Qualcast and Associated Engineering have made little progress.

Enterprise Board back plan to finance dealers

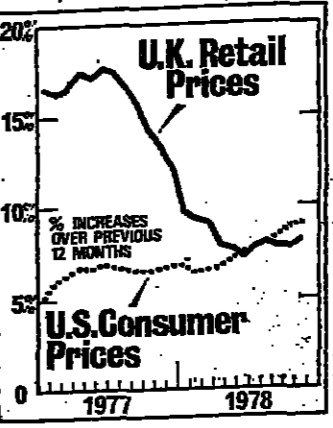
BY KENNETH GOODING, MOTOR INDUSTRY CORRESPONDENT

AN IMPORTANT role is to be played by the National Enterprise Board in an organisation being set up to provide finance for distributors and dealers of BL cars.

When car prices have risen rapidly and they have been called on to "top up" their bulk deposits. BL distributors have been pushing for a change for some time.

THE LEX COLUMN Gilts and the White Paper

Last week's half-hearted attempt by equities to start 1979 on a bright note failed to generate any echo in the long end of the gilt-edged market.



The Americans are thus following a cautious, flexible approach, as has the accounting profession in Britain following the demise of the exposure draft ED18 in 1977.

Experience with the interim Hyde guidelines has been patchy. Among the largest companies—the top 100, say—more than half have followed the recommendations.

Inflation accounts Inflation knows few boundaries, and with it goes its fellow traveller inflation accounting. During the past few months the year on year rate of consumer price rises in the U.K. level, which sets an appropriate background for today's press conference by the U.S. Financial Accounting Standards Board.

UK wins Chinese plastics plant order

By Kevin Dene A SECOND UK process plant manufacturer has made an important breakthrough in China winning a contract to build a petrochemicals plant.

Germans near peace on steel

BY JONATHAN CARR IN BONN

THE WEST GERMAN steel strike may end on Thursday as the result of an agreement between employer and trade union representatives. But there are hurdles to be cleared before a return to work becomes certain.

Vehicle makers—most recently Volkswagen—have said that they might have to introduce short time work from mid-January if the strike has not ended.

Weather

UK TODAY OCCASIONAL rain. Bright in places. Snow on higher ground in Scotland.

Medical Aid Plans by CRUSADER Who are pleased to announce their new U.K. contracts.

Company loans tax relief hint

BY DAVID FREUD

THE NEXT Finance Bill may contain tax relief for companies on raising loans and a relaxation in provisions covering interest on overdue tax.

They said that it placed British industry at a severe disadvantage to its foreign competitors, and inhibited setting-up of new businesses, or expansion.

BUSINESS CENTRES and HOLIDAY RESORTS tables listing various locations and services.

Continued from Page 1 Policy implications of lorry strike

Ministers, though the feeling was that the party's electoral chances were being severely damaged by the disruption caused by the disputes. This point is likely to be made again when senior Ministers meet members of the TUC's Economic Committee on Thursday.